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AUG 24 1931

ELECTRICAL WORLD

McGraw-Hill Publishing Company, Inc.

AUGUST 22, 1931
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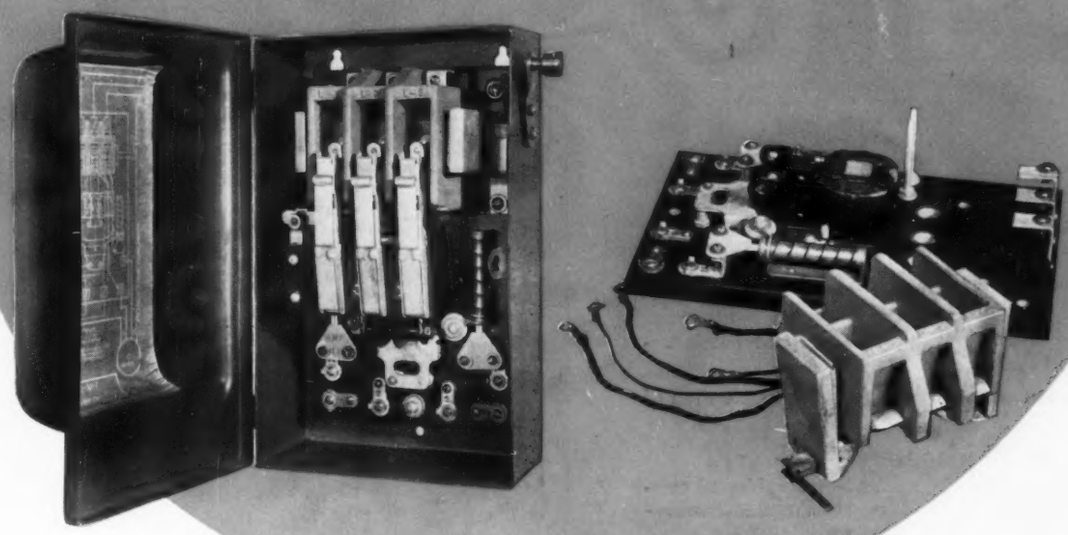
Self-Contained Disconnect *and* No Extra Space

(PATENTS PENDING)



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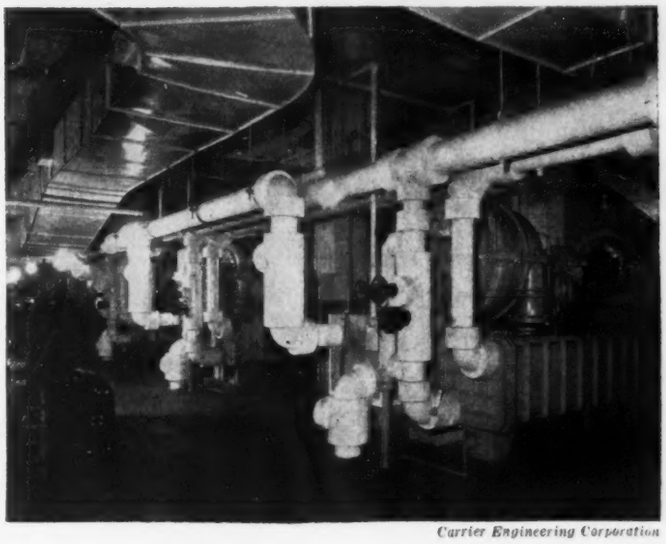

Air conditioning
J. L. Hudson store
Detroit, Mich.

Carrier Engineering Corporation

AUGUST 22, 1931

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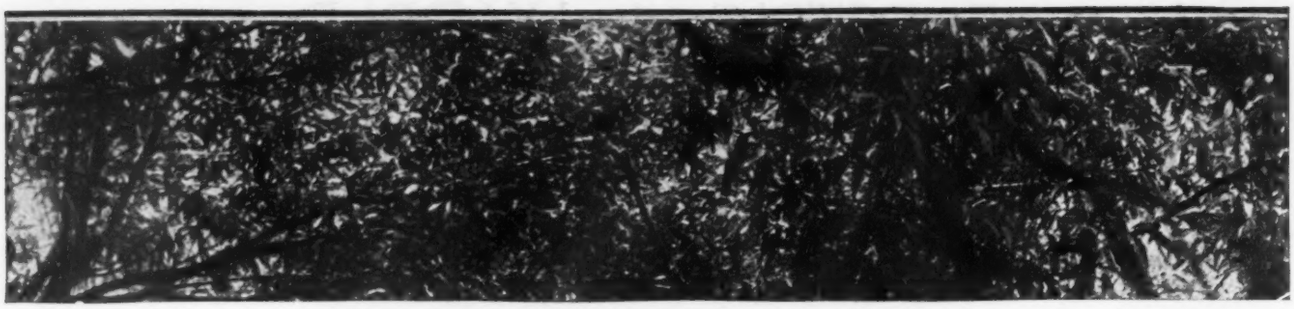

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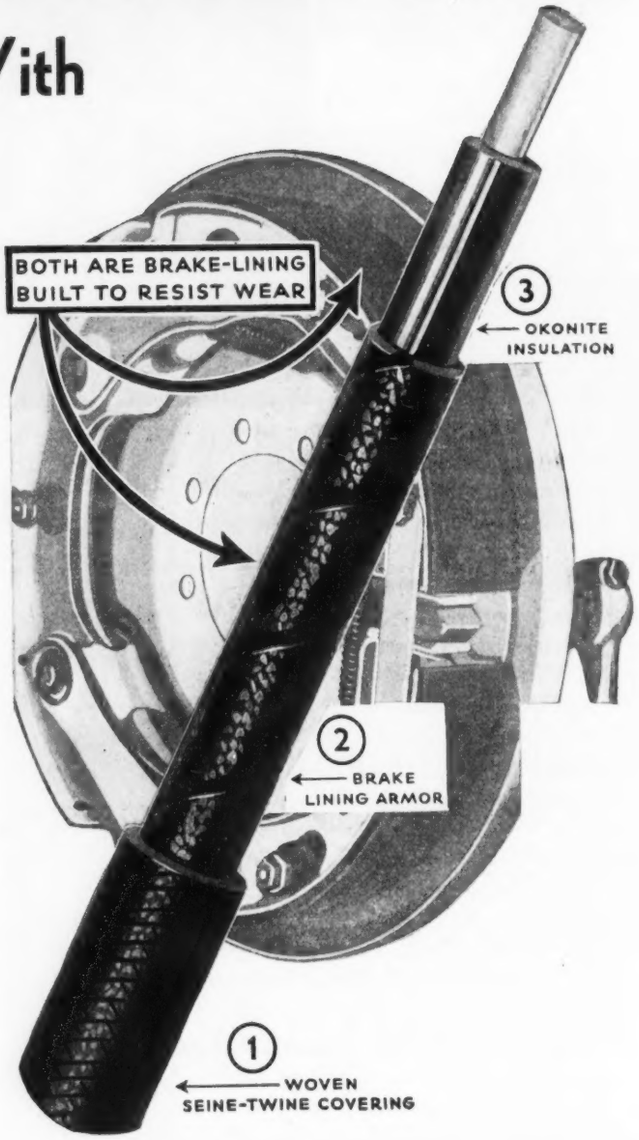

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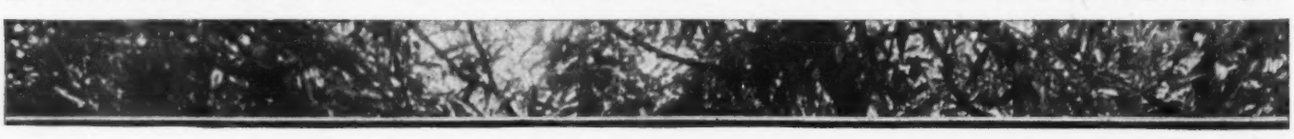

ELECTRICAL WORLD

for the Week Ending

August 22, 1931

West Virginia hydro law held invalid

—**Court rules on Cheat River,** holding the water-power act of 1929 to be unconstitutional since Legislature cannot commit legislative powers to the judiciary. New River projects also involved in this decision—*p. 310.*

—**Switch failures on networks** are controllable, concludes a metropolitan engineer whose experience shows balancing transformers to be helpful. Close voltage regulation obtained. Nine years' operation reported—*p. 335.*

We are now emerging from what perhaps is the most far-reaching of the cyclic economic disturbances that have occurred during my forty-odd years of active service in the electrical industry. Far from being downcast, I have supreme confidence that we are at the beginning of a new era even more significant in its possible advances than any that has gone before.

C. E. SKINNER,
President
American Institute of
Electrical Engineers.

Beauharnois row nears action stage

—**Power development to go on** in spite of the Dominion's greatest scandal. Government plans to demand that promoters resecure consent for Beauharnois project, though—*p. 312.*

—**Electrification of laundries** continues with new developments in equipment and control offering many advantages to proprietors. Control problems still dominate. Economies improve—*p. 338.*

Savings lie in interchange contracts

—**Flexible wiring plan devised** to meet needs of many types of small tenants in new office building. Adequacy and easy changes to meet rental area fluctuations without much cutting or patching was ideal—*p. 330.*

—**Chicago saves on interchange** by revision of energy charges which permits better utilization of most efficient plants. Bases for treatment of operating costs important, as is co-operative good will—*p. 327.*

—**1,000-kv. and 3,000-kv. tests** of heavy-duty equipment are closely controlled and accurately measured in new laboratory. Heretofore unprecedented accuracy results from improved apparatus and arrangements—*p. 324.*

Roosevelt reminds Hoover of New York's St. Lawrence interest

West Virginia Hydro Law Found Invalid, Blocking Large Hydro Projects

HOLDING the water-power act of 1929 unconstitutional, the Supreme Court of West Virginia on August 12 dismissed the suit of the West Virginia Power & Transmission Company to confirm its right to develop hydro-electric power on the Cheat River watershed. The decision was unanimous. The syllabus of the opinion, concurred in by the five judges, held that "the Legislature cannot commit powers which are primarily legislative to the judiciary."

The West Virginia Power & Transmission Company, a subsidiary of the West Penn system, had, as before reported, sought to construct thirteen projects on the Cheat River and its tributaries, the first four of which were estimated to cost $77,000,000, and its application had been granted in part by the Public Service Commission. The commission, with Governor Conley sitting as a member, had given the West Penn subsidiary a license for eight projects on the Cheat and Blackwater Rivers, but that decision was reversed and the case remanded to the commission by the Kanawha County Circuit Court on the ground that the evidence failed to show that advantages to the state as a whole outweighed the disadvantages. The court, however, upheld the constitutionality of the water-power act. The power company appealed to the State Supreme Court.

The Supreme Court holds that the act violated Article 5 of the state constitution providing for separation of powers of the legislative, executive and judicial branches of the government both by conferring legislative functions upon the Circuit Court of Kanawha County and by making the Governor a member of the commission in water-power cases. The first of these two findings is based upon a section of the act providing for an appeal as a matter of right by any party of interest from the commission to the court.

The Supreme Court refused to find that, since this provision was not necessary to the validity of the act, the act could be affirmed with the provision eliminated. West Virginia is left, therefore, once more without a water-power law or a commission authorized to grant licenses for hydro-electric development.

An application by the West Virginia Power Company, a subsidiary of the Appalachian Electric Power Company, for a license for two hydro-electric developments along New River, in Summers, Mercer and Monroe Counties, at an estimated cost of $23,000,000, has been pending for some months before the commission, but decision had been deferred pending disposition of the Cheat River case in the courts.

▼

Merchandising Situation in Kansas Still Unsettled

ALTHOUGH, FOR SOME REASON not clear, an absence of newspaper publicity seems to have characterized the decision, it is learned from a Kansas correspondent that the efforts of the City Service Company to circumvent the law in that state prohibiting utility companies from selling appliances resulted in the granting on August 4 by a Topeka court of a temporary injunction permitting the complainant to continue to sell appliances pending final determination.

The state failed to appear, as cited, on August 10 to show cause why the injunction should not be made permanent, and the hearing was continued to this week. The court has now granted the company until September 15 to file briefs in answer to briefs just filed by the state, but it is announced that there will be no decision before October. As before announced (ELECTRICAL WORLD, August 1, page 183), the Kansas Public Service Commission has asked an opinion from the State Supreme Court as to the constitutionality of the law.

▼

Gifford to Head National Council on Unemployment

PRESIDENTIAL APPOINTMENT of Walter S. Gifford, president American Telephone & Telegraph Company and long a prominent figure in the communication branch of electrical engineering and manufacturing, to head a nation-wide organization to deal with the employment situation was announced on Wednesday. Mr. Gifford, the President said, will "set up and direct such organization as may be desirable, with headquarters in Washington, to co-operate with the public authorities and to mobilize the national, state and local agencies of every kind which will have charge of the activities arising out of unemployment in various parts of the nation this winter."

Mr. Gifford, who during the war was director of the United States Council of National Defense, in announcing his acceptance of the responsibility, said: "It is already clear that, regardless of improvement in conditions, there will be need this winter for sustained and strengthened community and industrial action in many parts of the country. In some sections the load will be lighter, but in many parts it may be even

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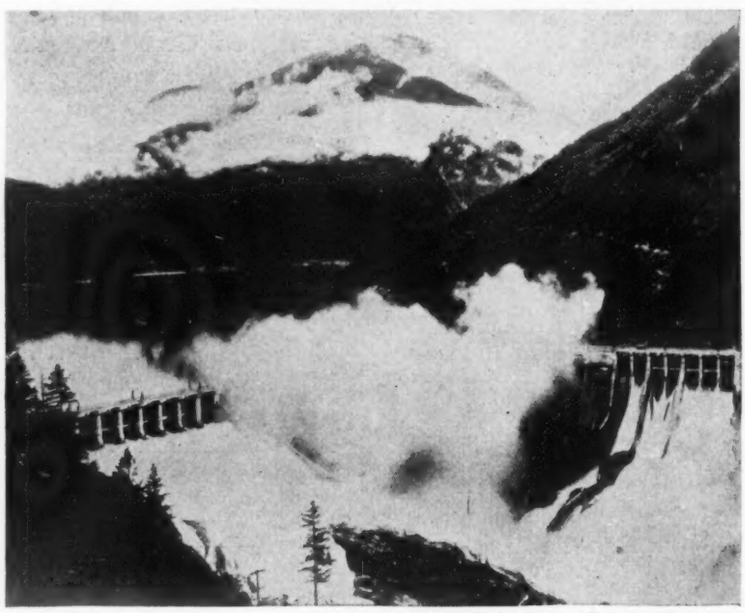
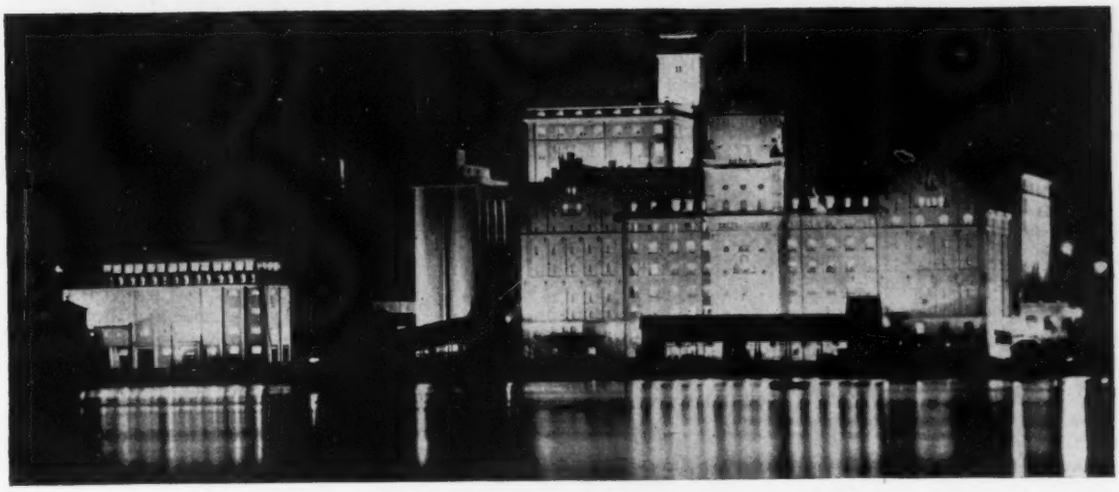
DIABLO DAM OVERFLOWS AFTER SUMMER RAINS



—*Wide World Photos; © Tinker Photos Co.*

No signs of drought could be seen at Seattle's new Skagit River plant after recent Northwest rains filled the reservoir to the brim—and then some.

SWEDISH INDUSTRY GRASPS THE ADVANTAGES OF FLOODLIGHTING



After dark sixteen 2,000-watt and eleven 1,000-watt floodlamps make the Saltsjogvarn, one of the largest factories in Stockholm, an ornament instead of a somber mass.

▼ ▼ ▼

greater. It is my belief that, whatever these burdens may prove to be, they will be whole-heartedly met. . I shall try to be of assistance to that end."

▼

Member of Shoals Board, Opposing Plan, Resigns

WILLIAM A. CALDWELL of Jackson, Tenn., has resigned his position on the Muscle Shoals Commission, according to announcement by Governor Henry Horton of that state.

In submitting his resignation to the Governor Mr. Caldwell said that he was poorly informed on the perplexities of the situation but unwilling to subscribe to a "preconceived plan to devote the property primarily to the production of fertilizer." He questioned the capacity of the plant to compet with modernly equipped plants and objected to the absence of any consideration of the possibility of devoting it to quantity production of electric power for small users.

▼

P.G.&E. Offers $5 Fee, State Demands $40,000

ASSERTING THAT a section of the California Political Code under which incorporation fees are graduated according to capitalization is unconstitutional, the Pacific Gas & Electric Company, San Francisco, has filed suit in the State Supreme Court asking for a writ of mandate. The company seeks to compel Frank C. Jordan, Secretary of State, to accept and file a certificate extending the company's corporate existence to April 10, 1981, for a fee of $5.

The power company states that it was incorporated in 1905 for a period of 50 years. Last April the directors were authorized to extend the incorporation period to 1981. Upon presenting the papers for filing and offering $5 in payment, the Secretary of State refused to accept either the papers or the fee, claiming under the code a payment of $40,000, based on a rate of $100 for each million dollars of the $400,000,000 capitalization. The company in its petition sets forth that the code section in question is unconstitutional in that it in reality imposes an excise tax.

▼

Rural Service Advances in Michigan and Oklahoma

RESULTS OF A SURVEY by counties of Michigan farms having electric light and power service recently completed by the statistical research department of the National Electric Light Association are announced by the Utilities Information Bureau of Michigan. The survey, based upon United States census data and reports from Michigan utilities, shows that on August 31, 1930, Michigan had 27,677 farms with electric service out of a total of 169,915 farms in the state. Seventy-eight counties out of a total of 83 reported electrified farms, and only five reported none.

Much information relative to the progress of farm electrification was brought forth in a meeting of the Oklahoma Committee on the Relation of Electricity to Agriculture at the Oklahoma A. & M. College, Stillwater, recently. Farmers who are using electricity participated in the discussions. Earl R. Miller, rural electrification research assistant, listed 23 test farms and the equipment on each. Most of the farmers are co-operating with the committee and the college in keeping daily records on the amount of electricity used by each class of equipment.

Dr. E. A. White of Chicago, chairman of the national committee, advised an investigation of the application of irrigation to agriculture and said that Oklahoma offered an opportunity for use of electricity in refrigeration.

The Oklahoma Gas & Electric Company, the Southwestern Light & Power Company, the Oklahoma Power & Water Company and the Public Service Company of Oklahoma are all participating in the committee's test.

Figures for Oklahoma for December 31, 1930, showed 4,192 electrified farms compared to 3,303 on December 31, 1929, an increase of 26.9 per cent, but only 2.1 per cent of Oklahoma farms were electrified on the former date.

▼

Cuts Return to 5 per Cent to Offset Past Profits

MAY A STATE regulatory body cut the rates of a utility below the figures necessary for a fair return on investment in order to compensate consumers for excessive rates permitted by the same commission in the past? This question—probably new in utility regulations—appears to have been raised by the action of the Connecticut Public Utilities Commission in ordering the Clinton Electric Light & Power Company, serving the towns of Clinton and Madison, to adopt a schedule that on the commission's valuation will bring the company a return of only 5 per cent.

The company in question has been enjoying a rate of 20 cents per kilowatt-

hour for the first 50 kw-hr. a month, the schedule being scaled down to 9⅛ cents for consumption in excess of 2,000 kw.-hr., all subject to a prompt-payment discount of 25 per cent. In addition there have been special lower tariffs for energy consumed for other purposes than house lighting. Asserting that the company's rate of dividend since 1922 has ranged from 10 to 30 per cent and that its depreciation reserve is "greatly excessive," the commission has prescribed alternative tariffs calculated to bring 5 per cent on a valuation made some years ago. The case is likely to find its way into the courts.

▼

No St. Lawrence Treaty Yet Under Negotiation

No negotiations are now in progress between the United States and Canada relative to the St. Lawrence waterway project, according to William R. Castle, Jr., acting Secretary of State. Mr. Castle's statement was contained in a letter written by him to Governor Roosevelt of New York in reply to one from Governor Roosevelt to President Hoover regarding the present political status of the proposed waterway and power plant. To his denial of negotiations Mr. Castle added: "It is obvious that when the time comes the interest of New York State will not be neglected."

While doubtless technically correct, Mr. Castle's statement is held in some quarters to be evasive since it is a matter of record that there have been interchanges between the United States and Canada on the St. Lawrence matter. His letter to Mr. Roosevelt was informal in nature, and the Governor, after its receipt, made public his own letter of inquiry to the President, sent on August 11. Through some blunder the receipt of the New York Executive's missive at the White House had been denied to newspaper men previous to Mr. Castle's reply.

▼

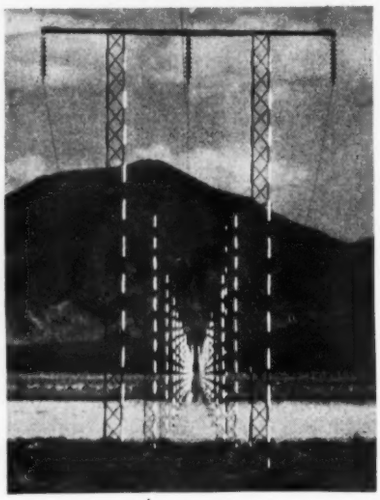
Iowa Municipal Plants Go to Private Control

Municipally owned electric light plants at Emmetsburg and Clarion, Iowa, around which much controversy and litigation have gone on for three years or more, were acquired last week by the Iowa Public Service Company of Sioux City. This ends a fight launched by H. A. Corey of Des Moines against private ownership.

The Corey plan was to turn the plants over to the municipalities when earnings had retired their bonded indebtedness and paid the promoter a small percentage. The plant at Emmetsburg, erected at a cost of $147,000, upon which a mortgage for $120,000 was held by a Des Moines bank, had been operated the past few months for the benefit and protection of the mortgage holders, and the Clarion plant, bonded for $160,000, had retired only $5,000 of bonds since its opening 20 months ago.

▼

WHERE CALIFORNIA AND NEVADA MEET—1931



Intense heat and wave vibrations are responsible for this unusual enlarged photograph (taken with a telescopic lens) of part of the Hoover Dam transmission line built by the Southern Sierras Power Company. The towers are 750 ft. apart, and those in sight cover 6 miles.

▼

Marietta Defeats Municipal Owership by 882

Municipal ownership of the electric light plant was defeated at Marietta, Ohio, in the August primary. Nearly 4,800 votes were cast, and victory rested with the opponents by 882 votes.

The contest was bitterly fought, and challengers were present in every precinct of the city on behalf of continued private ownership. An extensive advertising campaign was carried on until the last minute by a fact-finding committee, which fought a city-owned plant. Bitterness was injected into the campaign by the importation of outside speakers. Those opposing the plant brought Howell Wright, former director of public service at Cleveland, who urged defeat of the proposal.

Mayor F. A. Steadman, against municipal ownership, was renominated by the Republicans. Proponents of the municipal plant indicated that they would bring the subject up again.

▼

Beauharnois Controversy Still Active in Canada

How the Canadian government plans to proceed with further reference to the Beauharnois Power Corporation and those financially fostering the project is fairly indicated in political circles at Ottawa. In effect, it appears, the company will have to start all over again in the process of securing the consent of the government and otherwise complying with the legislation passed at the end of the session following the parliamentary inquiry. The intention of the government is to exact a new agreement covering the whole matter.

The company, it is further stated, will be expected for the purpose of navigation to hand over the government in fee simple the lands and appurtenances required for such purposes. Under the old order-in-council the government at any time was entitled to the free use and utilization of the canal for navigation, but ownership was vested in the company. Now, in respect to navigation, the government plans to be the owner and the company the user, conditions thus being reversed.

While it is intimated that the banks are prepared to carry on the financing of the works until October, there has been no further news regarding a change in management, as recommended in the report of the special parliamentary committee.

Policies of the Ontario Hydro are strongly criticised by political leaders and others, and a determined effort is being made by some of these critics to bring about an investigation into recent Hydro contracts and the provincial commission's dealings with the Beauharnois Power Corporation. In demanding such an inquiry in a statement issued in Toronto recently, W. E. N. Sinclair, leader of the Opposition in the Ontario Legislature, asserted that the Beauharnois episode showed that the government had departed entirely from the basic principle of the Hydro—power at cost. The commission was buying power at cost established by private enterprise.

▼

Merchandising Included in South Carolina Quiz

In sending out a general questionnaire to all light and power companies in South Carolina, the investigating committee set up in that state by this year's Legislature has included merchandising

of appliances as a topic of inquiry. The information thus sought will be in addition to data on cost and production of hydro, steam and internal-combustion plants; distribution and transmission system cost, franchises, load, rates, revenue, special contracts, energy bought and sold and other matters.

A letter has been sent to all light and power companies in the state which sell appliances asking information as to whether the merchandising business is segregated and as to classified receipts from merchandising for six years past, expenses incurred (cost of merchandise, rentals, selling, installing, servicing, etc.), and other points. "Do you believe," the committee asks, "that the present system of merchandising electrical appliances and equipment is productive of the best results from the standpoint of increasing the electrical load on your system?"

▼

Chairmen for 1931-32 A.I.E.E. Committees

AT THE AUGUST meeting of the board of directors of the American Institute of Electrical Engineers President Skinner announced the committee appointments for the administrative year beginning August 1, 1931. The chairmen are as follows:

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Power Transmission and Distribution—P. H. Chase.
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Transportation—E. L. Moreland.

Couch Tells About Plans for White River Plants

AFTER ANNOUNCING that the Carpenter Dam development, the Arkansas Power & Light Company's initial 56,000-kw. hydro-electric plant on the Ouachita River, will go into service about October 1, Harvey C. Couch, president of that company, interviewed recently by a representative of the *Executive's Magazine*, went on to relate the latest plans of his company for the development of the White River in that state, on which river an initial output of 126,000 kw. is now contemplated.

As before reported, three sites within a stretch of 20 miles have been made the subject of applications to the federal and state authorities. These are Wildcat Shoals, on the White River, 6 miles above Cotter; the North Fork of the White River, in Baxter County, and the Buffalo River, in Marion County.

At Wildcat Shoals a dam 225 ft. high and slightly less than a half mile long is planned. Initially it will be only 125 ft. high, permitting the generation of 67,000 hp. When the dam is raised to its full height it will produce four times this amount of power and create a lake approximately 100 miles long with an area of nearly 60 square miles.

The North Fork dam will be of concrete and steel, 175 ft. high and of slightly greater length than the Wildcat Shoals dam. The reservoir will have an area of 44 square miles and will be about 40 miles long.

The Buffalo River dam will be 145 ft. high and about the same length as the North Fork dam. The lake will have an area of about 9 square miles and will be about 33 miles long. The generating station, which will have a capacity of 20,000 kw., will be built at the end of a tunnel 3,400 ft. long driven through the solid rock of Indian Bend Ridge. In this way a head of 125 ft. will be obtained.

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Texas Attorney-General Criticises Utilities

ATTORNEY-GENERAL JAMES V. ALLRED has announced his intention to take court action and other measures to bring about a general reduction of public utility rates in Texas. He expressed the belief that these rates should be reduced to make them in line with the reduced prices and values of other commodities and services.

"My study of the problem has revealed that most of the utilities serving the people of Texas are controlled by individuals and corporations outside the state," Mr. Allred said. "In some instances the organizations are very complex. If any of these combinations are being operated in violation of our anti-trust laws, it is my purpose to prosecute them vigorously. The task is a great one and requires concerted action by state and local authorities.

"The gas and electric service companies have shown no disposition up to this time to pass on to the consuming public the savings they should be able to make as a result of cheaper materials and supplies and lower maintenance and operation costs. The rates which they charge are based upon property values which were established during a period of inflation and great prosperity. It seems unfair and unjust for them to demand and collect rates

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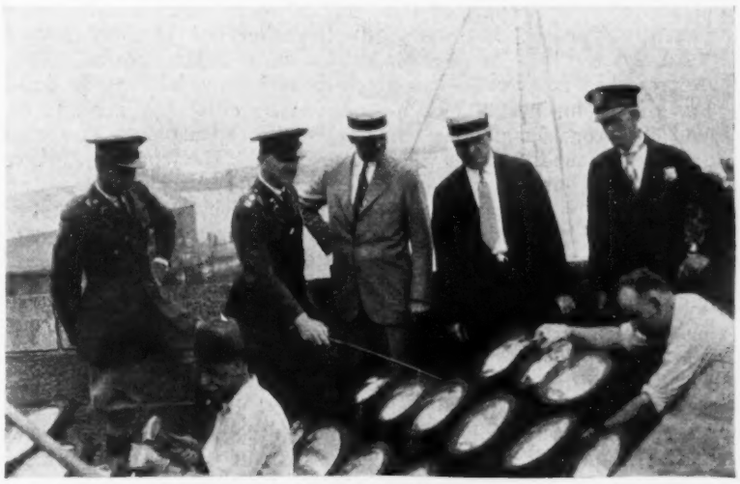
LIBERTY'S OLD LAMPS GIVE PLACE TO NEW ONES



Captain M. C. Brown, in command of Fort Wood, N. Y., discusses removal of the old lighting system of the Statue of Liberty with Charles E. Stephens, vice-president Westinghouse Electric & Manufacturing Company, who has charge of plans for installation of new system.

which will yield what they term a fair return upon such inflated and fictitious values."

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Engineering Foundation to Record Aid of Science

A NATION-WIDE SYMPOSIUM on engineering progress is announced by the Engineering Foundation. It will be conducted by that body in conjunction with the four major national engineering societies for which it functions as a research agency, and leaders of thought in many fields are expected to contribute to it.

"The motive in collecting and publishing a series of statements on benefits from engineering progress is to 'advance the good of mankind' by stimulating resourceful Americans to think their way through the passing months of maladjustment into effective action that will restore our normal state of steadily ascending happiness and freedom," the announcement says. "It is proposed to recall and record the vast contributions made to human progress and comfort by practical science, of which engineering is the instrument, and in this way to counteract the reaction against the machine age to which so much literary expression has recently been given.

"Even the engineers, chemists and industrialists who have provided present-day society with its astounding equipment for production have given relatively little thought to the deeper effects of their achievements upon the lives and characters of men and communities and peoples," the statement continues. "The painful present effects of our stupid neglect of the immaterial, or spiritual, consequences of our progress are demanding a reckoning. Capacity to produce has been achieved. Ability to discover and develop more and better goods and services also is part of the world's present equipment.

"How to divide the benefits of engineering progress has not yet been well enough learned by business to maintain, without disastrous fluctuations, the steady flow of enjoyment through well-ordered production, distribution and consumption. Perhaps the methods of engineering and science could be beneficially applied to some features of this problem also, supplementing progressive business methods."

The announcement was signed by H. Hobart Porter, chairman of the Engineering Foundation; Francis Lee Stuart, president of the American Society of Civil Engineers; Robert E. Tally, president of the American Institute of Mining and Metallurgical Engineers; Roy V. Wright, president of the American Society of Mechanical Engineers, and W. S. Lee, president of the American Institute of Electrical Engineers.

EIGHTY SUCCESSIVELY HARDER BUMPS TEST "MAZDAS"

In the Nela Park lamp development laboratory of the General Electric Company the new gravity impact tester, letting lamps drop repeatedly to the floor, determines their ruggedness of bulb, strength of filament and general perfection.

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Georgia Power Industrial Campaign Reaps Success

FOR FIVE YEARS the Georgia Power Company has conducted at large expense a "Forward Georgia" campaign under an industrial department established for the purpose with W. H. Barnwell at its head. The object was to help bring new industries to the state, through collecting and circulating data on manufacturing opportunities. One office to carry on this work has been maintained in Atlanta and one, under F. W. Hoover, in New York City, and especial benefit has been derived by cities too small to conduct large-scale advertising campaigns of their own. The company, of course, has not done this purely from motives of public spirit, but has sought by the sale of power to benefit financially as well as to deserve public commendation.

Its success has been marked, as figures made public for the last two years show. In 1930, despite the poor business conditions, the company was helpful in inducing 51 firms to establish plants in Georgia. These have a combined capital of $5,000,000, employ about 2,000 persons and have an annual payroll of $1,500,000. In 1929 and 1930 together the company was instrumental in bringing 65 plants, with a combined capital of $17,000,000, to the state. The industrial department negotiates only with firms that have a good rating and reputation and mean actually to manufacture, not merely to promote stock-selling concerns.

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Scattered Happenings in the Electrical Sphere

UNITED STATES

Idaho Municipal Plants Must Pay Tax

Municipal generating plants in Idaho must pay the 0.5-mill kilowatt-hour tax on energy generated, the same as private companies, according to a ruling of the Attorney-General. The city attorney of Idaho Falls has said the tax would be contested by that city on the ground that municipalities are constitutionally exempt from taxation. The Attorney-General maintains that the provisions of the kilowatt-hour tax are such that the exemption of municipalities does not apply.

Indiana Utility Agitations

Indianapolis seeks a revision of a ten-year street-lighting contract with the Indianapolis Power & Light Company which has four years to run, and the company is considering whether it is possible to comply. Kokomo wants the first step of its residential rate cut from 8 cents to 7 cents and talks of buying the Northern Indiana Power Company's distribution system. The Indiana Service Corporation has acquiesced in the dismissal of its petition to prevent the Decatur municipal plant authorities extending their lines into contiguous territory. A precedent for Indiana has been set in the filing by the city of North Manchester of a petition asking authority to acquire by condemnation proceedings that part of the property of the Northern Indiana Power Company within the city.

Phila. Electric Wants Insull Utilities

Application has been made to the Pennsylvania Public Service Commission by the Philadelphia Electric Company for permission to purchase from the Insull interests the Chester Valley Electric Company, the Chester Valley Electric Light, Heat & Power Company and the Coatesville Electric Light, Heat & Power Company, all in Chester County, Pa., and now working under operating agreements with the Philadelphia Electric.

Obstacles to Cle Elum Dam Removed

Power issues which have been tying up work on the Cle Elum dam on the Yakima River, Wash., have been settled at Washington, and announcement is made that the work will proceed at once. A pending contract for the improvement, to cost $3,500,000, will now be signed by the Reclamation Service. The settlement places no restriction on the sale of commercial power

by the Reclamation Service and leaves the final disposition of the power property to Congress.

Asks Further Rate Cuts in New York

Throwing doubt on the adequacy of the new domestic rate schedules in New York City, Corporation Counsel Hilly has written to Chairman Maltbie of the Public Service Commission asking him to consider the rates as tentative. He asks that Mr. Maltbie require the companies to file a quarterly accounting of the income under the new rates with a view to further reductions.

Duke Utilities Seek Tax Refund

Suits for recovery of $123,427 were filed recently in the United States District Court against the South Carolina Tax Commission by the Duke Power Company and its subsidiary, the Southern Public Utilities Company. These are the sums paid so far under protest by the complainants to meet the new tax on electricity generated in South Carolina. The Duke companies did not join in the application of other utilities to the federal court for injunctions restraining collection of the taxes. The Lockhart Power Company has also sued for a rebate.

Maryland Commission Values Utilities

Appraisal of the properties of the Potomac Edison Company in western Maryland, to be finished this fall, will be the final major activity of the Public Service Commission of Maryland in a series of examinations of power companies. Those already examined are the Consolidated Gas, Electric Light & Power Company of Baltimore and the Eastern Shore Power Company, which now includes the Maryland Light & Power Company. Rate-fixing proceedings may follow. The Potomac Edison Company, which is said to appraise its properties in Maryland at more than $20,000,000, has repeatedly claimed that it is not earning 6 per cent on its investment in the state.

Henry L. Doherty Fights Back

A half interest in the Kansas City (Mo.) *Journal-Post* has been purchased by Henry L. Doherty, head of the Cities Service Company, who announces that, while the editors will not be interfered with in their conduct of the paper, he will reserve the right to publish over his own signature such statements as he desires to make. Mr. Doherty's object in his part purchase of the newspaper is expressed as being "to meet the Kansas City *Star* on an equal footing" in its campaign against him and Cities Service.

Sikeston, Mo., Would Force Utility Out

Ouster proceedings have been filed in the Missouri Supreme Court against the Missouri Utilities Corporation in an attempt to compel the company to remove its electric light plant and distribution system from Sikeston, where the company's franchise expired on December 16, 1922. It has operated since that time without a franchise, but some months ago the city voted to construct a municipal plant, and on July 15 the Council ordered the company to remove its entire plant from the city. The company did not comply.

Champaign (Ill.) Consumers Protest

Thirty-five customers of the Illinois Power & Light Corporation in Champaign, classified as users of small power and commercial lighting, are asking the Illinois Commerce Commission to order a reduction in the rates charged them on the ground that they pay more than twice what similar customers of the company in Springfield pay. They even claim that they should be refunded $100,000 for alleged excess payments in the last three years.

Rate Reductions in Kansas

Commission hearings on the Kansas rates of the Empire District Electric Company, the Doherty Missouri utility which serves seventeen communities in southeastern Kansas, will be held in September. In the meantime company officials have agreed to consider reductions in Columbus and Baxter Springs, where customers are charged more than at Galena Springs, these being the three largest towns affected.

Cost of City Lighting in Louisville

Mayor Harrison of Louisville, Ky., is endeavoring to procure from the Louisville Gas & Electric Company a reduced rate for street lighting. His action is based in part on figures purporting to show the cost of electricity per lamp in seventeen scattered cities. His figures range all the way from $11.28 for Seattle to $91.42 for Boston, Louisville's figure is $57.03 against an average of $52.60.

Coming Meetings

American Institute of Electrical Engineers—Pacific Coast Division, Lake Tahoe, Calif., Aug. 25-28; district meeting, Kansas City, Mo., Oct. 22-24. F. L. Hutchinson, 33 W. 39th St., New York.

Rocky Mountain Division, N.E.L.A.—Stanley Hotel, Estes Park, Colo., Sept. 2-4. G. E. Lewis, 367 Gas & Electric Bldg., Denver.

Electrochemical Society — Hotel Utah, Salt Lake City, Sept. 2-5. C. G. Fink, Columbia University, New York.

Southwest Power Conference—Kansas City, Sept. 7-11. A. L. Maillard, 1330 Grand Ave., Kansas City.

Pennsylvania Electric Association — Bedford Springs Hotel, Bedford Springs, Pa., Sept. 9-11. H. A. Buch, Telegraph Bldg., Harrisburg.

Empire State Gas and Electric Association—The Sagamore, Bolton Landing, Lake George, N. Y., Sept. 10-11. C. H. B. Chapin, Grand Central Terminal, New York.

International Association of Electrical Inspectors—Eastern and Western Sections (joint meeting), Pittsburgh, Sept. 14-17. R. W. E. Moore, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Southern Section, Dallas, Sept. 21-23. R. L. Gatewood, P. O. box 1743, Atlanta. Southwestern Section, Sacramento, Calif., Sept. 28-30. C. W. Mitchell, 914 Merchants' Exchange Bldg., San Francisco. Northwestern Section, Salem, Ore., Oct. 5-7. F. D. Weber, 414 Lumbermen's Bldg., Portland, Ore.

American Welding Society — Copley-Plaza Hotel, Boston, Sept. 21-25. M. M. Kelly, 33 W. 39th St., New York.

New England Division, N.E.L.A.—Poland Springs House, South Poland, Me., Sept. 28-30. Miss O. A. Bursiel, 20 Providence St., Boston.

American Association of Engineers—Huntington, W. Va., Sept. 28-30. M. E. McIver, Willoughby Tower Chicago.

Great Lakes Division, N.E.L.A.—French Lick Springs Hotel, French Lick, Ind., Oct. 1-3. T. C. Polk, 20 N. Wacker Drive, Chicago.

Association of Electragists International—Hot Springs, Ark., Oct. 5-8. L. W. Davis, 420 Lexington Ave., New York.

Illuminating Engineering Society—William Penn Hotel, Pittsburgh, Oct. 13-16. E. H. Hobbie, 29 W. 39th St., New York.

National Association of Railroad and Utilities Commissioners — Jefferson Hotel, Richmond, Va., Oct. 20-23. J. B. Walker, 270 Madison Ave., New York.

Wisconsin Utilities Association—Commercial Section, Oct. 22-23. Hotel Loraine, Madison. J. N. Cadby, 135 W. Wells St., Milwaukee.

CANADA

Middle West Utilities to Merge

Arrangements are reported to be in progress for acquisition by the Great Lakes Power Company of assets of the Algoma District Power Company. The companies are subsidiaries of the Middle West Utilities Company of Canada and are already being operated under joint management. The Algoma District Power has recently completed the development of 35,000 hp. at High Falls on the Michipicoten River.

Sabotage Follows Montreal Strike

Following a dispute between the Montreal Light, Heat & Power Consolidated and its linemen, which resulted in 175 men going on strike, a tower owned by the Shawinigan Water & Power Company, carrying power lines from Shawinigan, was dynamited from its cement base, thereby endangering Montreal's supply of electricity. Three light poles bearing the high-tension wires from the Cedars Rapids plant were also dynamited, a large part of the north end of the city being plunged into darkness.

ABROAD

New British Tidal Project

A privately financed project for harnessing the tides that flow up the River Gannel, a small English stream between high banks, and using the impounded waters for generating electricity, is unique in that no revenue or profit is involved. The plant, if built, will be used solely to prove the possibility of harnessing tidal waters and producing energy on a sound commercial basis by the use of a two-way or double-flow turbine. Energy Limited is the promoting corporation.

General Electric Company

Flash welding

Fast, sure and strong the fabrication of transformer tanks takes place in this electric flash welder. No metal other than the steel plate itself is introduced and the welds are of unusual density. In but six seconds the adjoining edges of a rolled sheet become as the sheet itself. This machine accommodates steel plates up to 60 in. in length and one-eighth of an inch in thickness. Another step in electrical production methods

EDITORIALS

L.W.W.MORROW
Editor

Federal Power Commission also investigates

OUT of the welter of political trouble involving the Federal Power Commission comes a grand-stand play by its members. Out goes a long questionnaire to all utilities that have any kind of license or have applied for a license. This requires that the utilities give the commission every detail of finance, management, operation and control by September 15 next. A special assistant is employed for four months to superintend the investigation.

We doubt the authority of the commission to make such an inquiry and question its wisdom in duplicating the work of the Federal Trade Commission. The answers to the Federal Trade Commission questionnaires give all necessary data about utilities. Nor do we think it possible even to scratch the surface of the subject in four months. It has taken since 1928 for the Federal Trade investigation to get to the middle of its work despite a large staff and large expenditures of money. Any competent study of the utility business is a job of five years at a high cost.

The Federal Power Commission has plenty of constructive work to do without paralleling the Federal Trade investigation. It has enough conflicts with states and with utilities over water powers to give it work for years. It has many applications and disputes before it. It should stimulate and not handicap water-power development. Yet its recent acts seem to be based upon the idea that it is expedient to make political capital out of a new investigation and stifle legitimate attempts to develop water power. While President Hoover, on the one hand, is trying to establish a little business confidence and create employment, here, on the other hand, is the commission acting in a very definite way to destroy confidence in the utility industry and prevent construction and employment that would follow the encouragement of hydro-electric plants.

The industry welcomes a fair and helpful federal regulatory authority over water-power development. It fails to find this attitude in recent acts of the commission. Nor, with the constructive work now needed from the commission, is it reasonable to excuse the questionnaire on the plea that some day this commission will be empowered to function as the federal regulatory authority over the utilities and that therefore the commissioners now need to know all about the business. We fail to see any legitimate background for this Federal Power Commission investigation. It is a futile gesture.

The auction block for Muscle Shoals

THE latest attempt to dispose of Muscle Shoals is interesting and even amusing. The new and expert commission writes to 136 organizations and says in effect: How much will you give for a lease of this great project? An enterprise with an original cost of $127,000,000 thus becomes an auctioneering bargain. To banking houses, industrial plants, chemical companies, utilities in the neighborhood and those far distant there goes from the auction block the clarion call to offer bids. One can anticipate the variety, the complexity, the range and the ridiculousness of replies from sources so miscellaneous.

No one knows whether this governmental jewel is gold, silver or plated. To most it appears to rate as an antique, without, however, having equivalent market or decorative values. And

again in leasing it there should be a few guarantees as to its quality, freedom to use it, change it or buy it. But no; even if leased, it would not be controlled. The invitation is to make a guess bid and then take a chance that the agreement will be fair when, if ever, it comes to be written by Congress.

After years of study, reports, investigation, rust and what not, the project comes up at auction for leasing under conditions where no business intelligence can be exerted by most of the bidders. Today, as was the case years ago, Muscle Shoals is of use to adjacent utilities in connection with full development of the Tennessee River. It has no value as an industrial project except as sucker bait and a political catspaw. But why worry these warm days?—the bids will be amusing at least.

Let there be no repetition of the gambling orgy

UTILITY executives whose concern it is to balance capital structures at times feel the need of more adequate and accurate standards of value for common stocks than now exist. So also do executives whose care is public relations. Fluctuations such as have been experienced in the past two years tend to imperil these relations, especially since stocks usually pass to weak hands at or close to top prices.

With the element of risk and uncertainty largely removed from utility operations, why should these wide fluctuations take place? Why should the price of one active utility issue listed on the New York Stock Exchange have run from 90 to 200 in a few weeks and then have its "value" divided by ten within twenty months? Why should nearly a billion dollars have been written off aggregate stock values of utilities within a month recently? Why should the stocks of eminently stable companies be utterly lacking in stability?

These erratic gyrations, lacking any corresponding change in asset values, earnings or outlook, urgently suggest the need for an attempt to stabilize values. Since the utilities may be adversely affected, leadership by so strong a group in an effort to establish some sort of price areas based on reason rather than purely on chance commends itself. As to the feasibility of such a plan, it is of interest that this week a leading utility found it advisable to urge upon the holders of a certain callable security the fact that current prices are unduly high in relation to the call price.

This incident merely suggests the possibility of utility executives taking a stand to discourage absurd price levels in the future in the case of common stocks. The details of such an accomplishment would require much study, but the subject is one which merits consideration at least.

Power problem rates in fortieth place

THOSE who have belittled the political potentiality of the "power trust" issue will find much comfort in the result of a survey by the National Economic League. The much-exploited power issue was assigned fortieth place after collating the answers elicited from the five thousand persons interrogated. That surely does not look as if the answering group could be stampeded by spellbinders and their catch-phrase slogans into believing that the salvation of the world hinges on blocking the wheels of electrical progress.

Thirty-nine other topics of current interest were deemed by these thinking individuals to be more in need of adjustment through political or economic channels. Internationalism, socialism and communism, armaments and conservation all rated higher than power. Nearer the top in importance fell taxation and business recovery. At the very top stood prohibition. It was followed by administration of justice, lawlessness and crime, unemployment, the world court. Some of these issues are readily susceptible of popular treatment, and, with the continued spread of concern about these elements disturbing our national tranquillity and even stability, it will be a near-sighted demagogue who adheres to any present intention to use the "power trust" myth as a smoke screen to conceal his ignorance.

Public understanding of the business of rendering power service is still not very lucid. It need not be all-comprehensive if the public tendency toward contentment with good service and good prices is amplified by a disposition on the part of the industry to dispel the mystery about the business. An era of prosperity might have directed attention from the period's real major problems toward a distinctly minor one. But the persistence of the business doldrums emphasizes

pessimistic influences like prohibition, crime, unemployment and taxation. The results of the survey add to the hope that the electorate will turn a deaf ear to utterances of pure subterfuge and demand the removal of substantial deterrents to our economic wellbeing.

Anti-merchandising legislation not in dealers' interest

JUDGING from the support given utility anti-merchandising legislation by some dealers and organized groups, it would appear that such groups feel that they would benefit if the utility were out of the merchandising business. Assuming that there would be no falling off in total volume of business done if the power companies ceased merchandising, would the business now done by the utilities be divided among the existing dealers or would it go elsewhere?

There is no reason to believe that manufacturers now doing the bulk of the business would relinquish their hold just because of the destruction of their major outlet. With the promotional force of the utility gone from the field, the only alternative for the manufacturer would be to seek new and stronger outlets. Experience has convinced him that he cannot secure national volume through present dealers. Trained selling organizations would be thrown into the field and would offer the dealer a type of competition infinitely more formidable than that of the utility. Witness what has happened in the refrigeration field, where manufacturers own or control their own retail outlets. Dealers well know what this competition has meant to them.

Under the present set-up, with the power company in the field co-operating with dealers and creating business for all, the manufacturer is interested in building sales through *all* outlets. But if he is driven to control his own retail outlets, he will then become the dealers' most active competitor. Which would be more in the interest of the dealer—a type of competition under which the manufacturer would be interested solely in selling his own product or the co-operation of the utility in promoting the sale of all good electrical appliances regardless of brand?

This is not a threat on the part of the manufacturer, the utility or any other group. It is simply the logical and natural evolutionary outcome of any problem of retail distribution. In any event, the manufacturer is going to get volume distribution and the utility's domestic load is going to grow, and neither is particularly concerned which way the tide turns. Instead of quarreling with each other, those in charge of existing sales outlets should work together to get the market developed on a profitable basis. More outlets are needed, not fewer, and the big problem is intelligent selling. If distributors cannot learn how to bring this about through existing sales outlets, new ones will inevitably be formed.

Engineering departments should be co-ordinated

ON SEVERAL properties where holding-company engineering services are available through a branch staff there have developed a dissimilarity of practices and certain conflicts due to lack of co-ordinated effort and understanding as to where responsibilities begin, end or overlap for branch-office men and local-property field engineers. The result, say observers, has been an unfortunate and costly duplication of effort, loss of time in seeing jobs through and, in some cases, seriously impaired engineering results.

The only way to secure co-ordination and efficiency in such cases is to have, first, amicable relationships and, second, unit organizational functioning. The engineers of the holding-company staff, having a clear picture of the system design, are well in position to aid in producing rational over-all plant engineering. The local-property men possess intimate knowledge of factors which may alter any generalized thinking. Working together they offer the best of all combinations.

Co-ordination can best be achieved by resident engineering managers and local operating-company executives agreeing upon working arrangements. Generalizations cannot be drawn which will suit any and all properties, but a master engineering plan and guide for local men to follow and deviate from only upon consultation would greatly help the situation. Management may well institute full co-operation and understanding and thus abolish the chip-on-the-shoulder attitude that is now not infrequently encountered.

New Synchronous Motor for High-Torque Loads

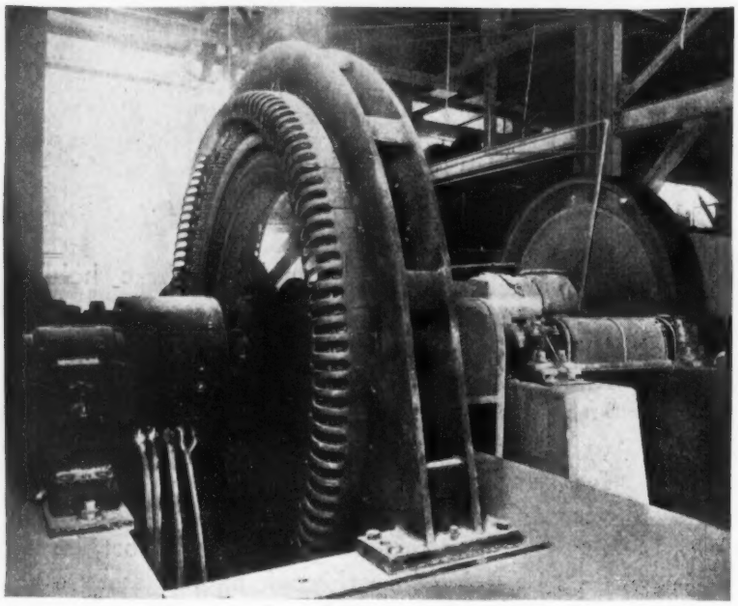


Fig. 1—300-hp., 138-r.p.m., 80 per cent power factor Simplex synchronous motor driving 6-in. x 22-ft. tube mill for grinding cement clinker

Adjustable starting torque up to 225 per cent.
Uses damper winding of special design.
New type field sectionalizing switch.
Low starting current inrush.

By R. S. WRIGHT
General Engineer
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

IN RECENT years improvements in design permitting motors to be started on full voltage have resulted in synchronous motors delivering high-starting and pull-in torques. If we consider the compressor motor, delivering 50 per cent starting, 40 per cent pull-in and 150 per cent pull-out torques with 275 per cent current inrush, as the criterion for frame size and inrush, the high-torque motor will be oversize and will require high starting current.

Many machines, such as tube and compartment mills used in the cement industry for fine grinding and ball mills used in the mining industry for ore reduction, require pull-in torque in excess of 100 per cent and starting torque as high as 200 per cent. In many instances low starting current is of the utmost importance because of the size of the motor in relation to the rest of the plant equipment or because of limitations contained in the power contract. A 60-cycle, 164-r.p.m. motor of standard type of construction developing 110 per cent pull-in and 175 per cent starting torque will have a starting inrush of about 675 per cent and the frame size will be the same as for a compressor motor of approximately twice the horsepower rating. Such motors have been used where high starting current is not objectionable.

Design engineers worked for several years to perfect a motor having the desirable running characteristics of a standard synchronous motor yet capable of developing high starting and pull-in torque with low starting current. The result of these investigations has been the development of a new low-speed (450-r.p.m. and below) motor of unusual character which has mechanical simplicity and is a highly efficient, salient-pole, synchronous machine having starting and accelerating characteristics similar to the well-known wound-rotor induction motor. It provides adjustable starting torques up to 225 per cent and pull-in torque in excess of full-load torque with remarkably low kva. inrush.

The desirable starting and accelerating characteristics result from the use of a damper winding of special form. This damper winding consists, as usual, of a single conductor per slot in the pole face, but instead of being connected to short-circuiting end rings these conductors are phase connected, with the ends brought out through slip rings to an external starting resistor. The pole faces are made broader than usual in order that the damper winding may occupy a larger portion of the pole pitch.

To increase the ratio of starting torque to starting kva. the rim to which the poles are bolted is laminated and the field is open circuited during starting. The laminated pole rim minimizes the eddy currents normally present in this member. This construction, consisting of thin steel laminations stacked on bolts and clamped between heavy rolled steel end plates, results in the unusual appearance of the rotor shown in Fig. 2. Open-field starting results in a high power factor during the starting period as compared with that which is obtained when the field winding is closed on a resistor in the ordinary manner.

Open-field starting with fields designed for 125- or

250-volt excitation is accomplished with a sectionalizing switch which breaks the field into several sections during starting. The number of field turns in series, and, hence, the voltage induced in each section of the field by transformer action, is thereby reduced. This induced voltage is maximum at standstill and decreases to zero as the rotor reaches synchronous speed.

The sectionalizing switch, shown in Fig. 3 with the cover removed, comprises two or more insulated contact segments mounted on a sleeve which rotate to bridge stationary contacts. A weighted arm connected to the rotating member is held against a stop by a restraining spring until the centrifugal force on the adjustable weight develops sufficient torque to overbalance the torque exerted by the restraining spring. The switch is adjusted during the motor test to close only upon the existence of a predetermined induced voltage. The mechanism is so designed that as the weight flies out the torque it develops increases, while the opposing torque exerted by the spring decreases. This results in rapid travel of the switch to the closed position once motion is initiated. Upon stopping the motor the low torque exerted by the spring causes the switch to remain closed until a relatively low speed is reached, the field meanwhile being connected to a discharge resistor and opened in the usual manner by the field switch on the control panel. The control is so arranged that it is impossible to start the motor with this switch in the closed position.

The three damper winding and two field slip rings are assembled as a unit and are protected from dust by a sheet-steel housing supported from the mill type front pedestal bearing. Installation of the motor is facilitated by the motor being self-contained on a heavy structural steel bedplate.

The data on two of the new motors given in the accompanying table illustrate the results that can be attained with this type of construction.

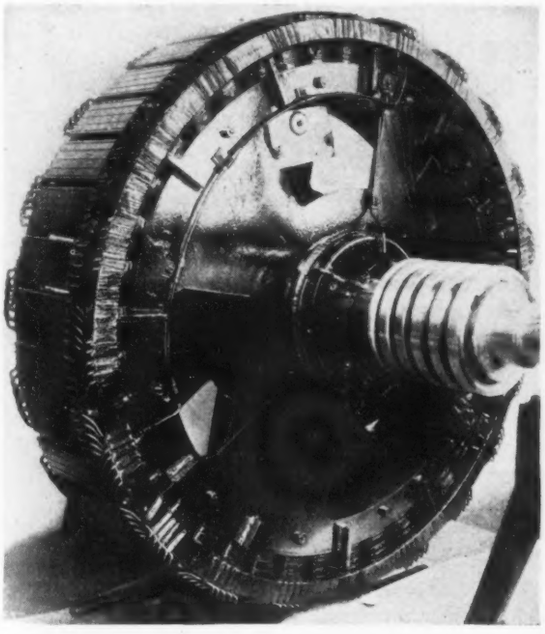


Fig. 2—Rotor of 500-hp., 171.5-r.p.m. Simplex motor showing phase wound damper winding and sectionalizing switch

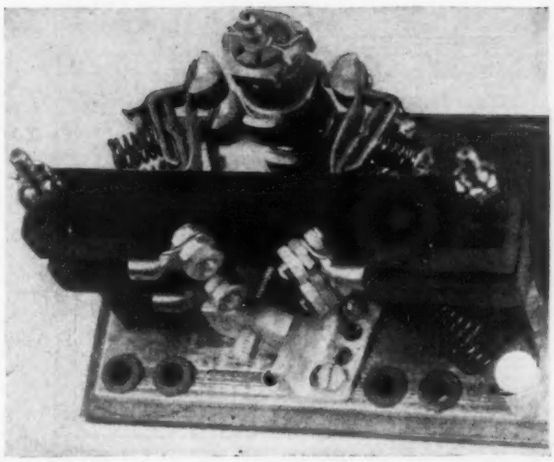


Fig. 3—Field sectionalizing switch assembly

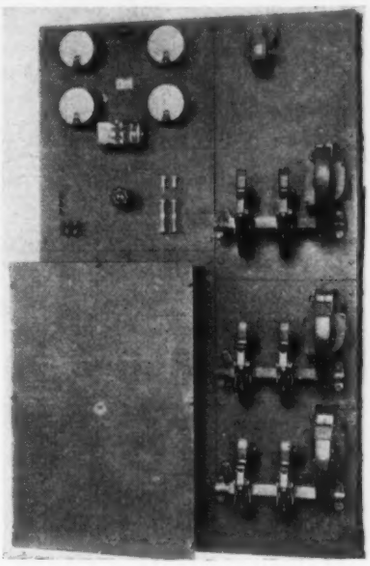


Fig. 4—Controller for 500-hp. Simplex synchronous motor

The extent of improvement in starting torque to starting kva. ratios resulting from this construction may be further appreciated by comparison of the value 0.67 to 0.73 for the above motors with the value 0.26 for the motor of standard construction developing high-starting and pull-in torques. As compared with the compressor motor discussed earlier, the new motor delivers more than three times the starting and pull-in torques with the same kva. inrush.

An outstanding feature of the motor is the ease with which the starting torque may be varied with corresponding change in starting kva. to meet the requirements of the load and eliminate unnecessary stress or shock on the driven machine. The two values of starting torque shown for each motor in the tabulation below result

Horsepower	350	1,250
Speed	400	180
Power factor, per cent	80	80
Per Cent Starting Torque:		
First step resistance	152	163
Second step resistance	190	205
Per Cent Starting Kva. Based on Full Load 100 per Cent Power Factor:		
First step resistance	208	234
Second step resistance	269	307
Ratio per Cent Starting Torque to per Cent Starting Kva.:		
First step resistance	0.73	0.70
Second step resistance	0.71	0.67
Per cent pull-in torque	118	163
Per cent pull-out torque	210	292

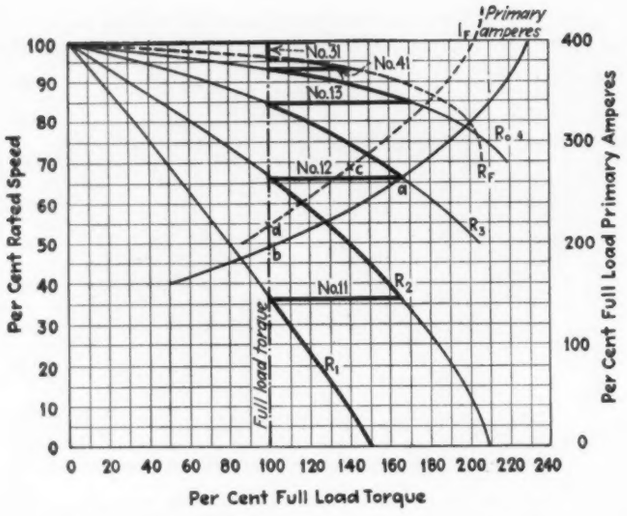


Fig. 5—Typical speed-torque curve for Simplex synchronous motor

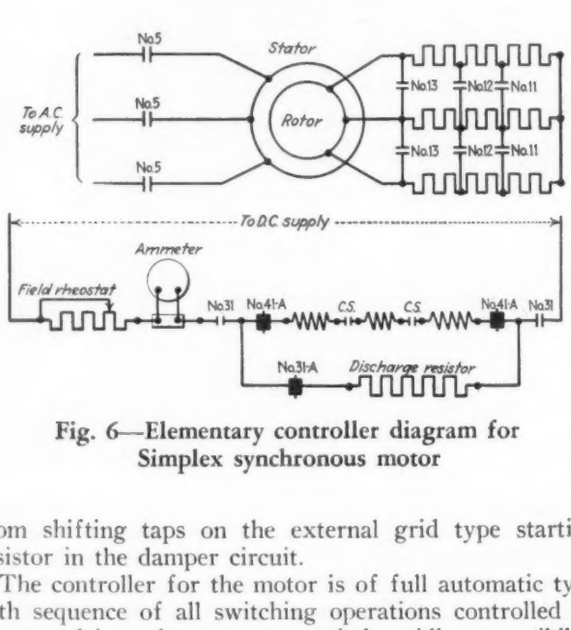


Fig. 6—Elementary controller diagram for Simplex synchronous motor

from shifting taps on the external grid type starting resistor in the damper circuit.

The controller for the motor is of full automatic type with sequence of all switching operations controlled by a motor-driven drum master switch. All responsibility for correct starting is thus taken out of the hands of the operator, who merely manipulates a "start-stop" push button located at any convenient point. An "inching" feature is provided for applications where the driven machine must be rotated to a definite position.

Operation of control equipment

The operation of the equipment may be readily understood by referring to the typical speed-torque curve, Fig. 5, and the elementary controller diagram, Fig. 6. When the start button is closed the motor-driven master drum starts to rotate and causes auxiliary field switch No. 41-A to operate and open the field circuit, which is already sectionalized by the centrifugal switch *CS*. Primary switch No. 5 closes, applying full line voltage to the primary winding with sufficient resistance in the damper winding circuit to give the desired initial torque; for example, 150 per cent with 250 per cent current. If the torque developed on the first point will not start the load the motor remains at rest a few seconds until the master switch operates No. 11, thus transferring operation to curve R_2, giving a standstill torque of 210 per cent with 350 per cent current. Should this torque be insufficient to start the load an overload relay will remove the motor from the line.

If 150 per cent torque is sufficient to start the load the motor accelerates along curve R_1 until a balancing speed is reached at the load torque which we will assume to be equal to full load. The motor operates at this speed until the master switch operates No. 11 to cut out part of the secondary resistance and transfer operation to curve R_2. The motor accelerates along R_2 to 100 per cent load, then after a predetermined time No. 12 is operated and the motor accelerates along R_3 to the balancing speed, after which No. 13 is operated to short out all of the secondary resistance and the motor accelerates along R_0 to approximately 93 per cent speed. Before this speed is reached the field sectionalizing switch (*CS*) has operated to connect the various sections of the field in series. At a predetermined interval after closure of No. 13 the auxiliary field switch is de-energized, closing the field on a suitable resistor, and the motor operates on curve R_F. Before transfer to curve R_F the primary current varies between *a* and *b* on curve *I* and after transfer to R_F between *c* and *d* on curve I_F. The motor is now operating near synchronism and when field switch No. 31 is finally closed the motor synchronizes and thereafter operates as an ordinary synchronous motor.

The first unit of this type was installed late in 1929 and since that time a total of eighteen units representing 7,500 hp. have been installed. These include three 350-hp., 167-r.p.m., 80 per cent power-factor units for a cement plant in Spain and one 800-hp. and two 600-hp., 187.5-r.p.m., unity-power-factor units for similar application in Japan.

▼

Electrically Heated Greenhouse

By G. N. HAWLEY
Industrial Heating Engineer
Southern California Edison Company, Ltd.,
Los Angeles, Calif.

Electric heating of a greenhouse at Riverside, Calif., has proved so successful that another new and profitable field for industrial heating has been opened to the power company and nurserymen are able to make a 75 per cent saving in investment for heating equipment. Heat was applied by stringing weatherproof iron wire on split knobs under the benches as shown in one of the accompanying illustrations. Two circuits of No. 12 B.W.G. weatherproof iron wire, each 870 ft. in length, were used. These circuits consist of series loops of twelve wires each placed on 9-in. centers. One circuit was placed under the center bench and the other was divided equally between the two outside benches.

With 220 volts impressed on these circuits the current is 33 amp. per circuit and the energy required is 7.2 kw. At this current the wire temperature is approximately 170 deg. F. and the energy dissipated is 8.4 watts per lineal foot of wire. A thermostat placed under the cen-

ter bench turns the current on when the temperature reaches a minimum of 45 deg. and cuts it off at 50 deg. Outside temperature on the coldest nights was 28 deg. above zero and under these conditions 15 kw. of heating held the inside temperature 17 deg. above that outside. For two months last winter when heat was required the consumption was 3,060 kw.-hr. and the bill $61.20, or an average of $30.60 per month. This is about equivalent to what oil would have cost for an ordinary hot-water heating plant, but in addition to being fully automatic the electric heating installation has the big advantage that it cost only $90 completely installed, as against a cost of $400 for a steam heating plant.

The secret of success in applying electric heat to a greenhouse is in keeping the temperature gradient between the wire and the surrounding air low, otherwise the air is circulated too rapidly and most of the heat is lost through the roof of the building. Operating the wire at 170 deg. was found to be about the optimum temperature. Incidentally, this is about the temperature at which hot water pipes are operated in that type of installation. Those interested in electric heating of greenhouses will note that approximately 1 kw. of installed capacity is required for each degree rise necessary above the temperature of the outside air. However, exposure to cold winds might alter this considerably.

This was purely an experimental installation, made with the idea that if successful a protective screen would be placed beneath the wires to eliminate any hazard that might exist and to make the installation comply with all code and accident commission requirements. Since this installation was made manufacturers have developed a lead-covered resistance cable for soil heating which is admirably suited to greenhouses and similar applications and which will meet all code or city ordinance requirements. Also, it has been found practicable to use No. 14 and No. 16 single-conductor, rubber-insulated, lead-covered copper wire, similar to shielded radio lead-in wire, at ratings not to exceed 4 watts per lineal foot. In all cases where lead-covered wire is used the sheath should be grounded.

The accompanying table gives useful data on two sizes of iron wire and on two sizes and makes of lead-covered resistance cable.

Data on Resistance Wire for Soil Warming and Greenhouse Heating

Heating Wire No. 14 B & SG Weatherproof Copper, Hot Resistance 2.823 Ohms per 1,000 Ft.

Temp. Rise Deg. F. for Soil†	Volts	No. Feet Wire	Amperes	Total Kw.	*Total Sq.Ft. Soil	Watts per Lineal Foot
10	110	1,000	39.0	4.3	3,000	4.3
15	110	800	48.6	5.4	2,300	6.7
20	110	725	53.6	5.9	2,000	8.1
10	220	2,000	39.0	8.6	6,000	4.7
15	220	1,600	48.6	10.7	4,600	6.7
20	220	1,450	53.6	11.8	4,000	8.1

*Approx. for air heating.

Heating Wire No. 12 B.W.G. Weatherproof Iron, Hot Resistance 7.64 Ohms per 1,000 Ft.

15	110	485	29.7	3.3	†1,400	6.7
20	110	435	33.1	3.6	1,300	8.4
25	110	400	36.0	4.0	1,200	9.9
15	220	970	29.7	6.6	2,800	6.7
20	220	870	33.1	7.2	2,600	8.4
25	220	800	36.0	7.9	2,400	9.9

† Wires assumed 3 ft. apart.

Heating Wire No. 14, B & SG. G. E. Lead-Covered Resistance, Cable Resistance 46.0 Ohms per 1,000 Ft.

15	110	200	12.0	1.32	‡200	6.6
25	110	165	14.5	1.60	165	9.7
15	220	400	12.0	2.64	400	6.6
25	220	330	14.5	3.20	330	9.7

Heating Wire No. 22, B & SG General Cable Corporation Lead-Covered Resistance, Cable Resistance 495 Ohms per 1,000 Ft.

				Watts		
15	110	60	3.7	400	‡60	6.7
25	110	50	4.5	500	50	10.2
15	220	120	3.7	800	120	6.7
25	220	100	4.5	1,000	100	10.2

‡ Wires assumed 1 ft. apart.

7.2 kw. of heating was applied under plant beds by simply stringing resistance wire on split knobs

A $90 electric heating installations in this 20x75 ft. greenhouse took the place of a $400 steam heating plant

1,000-Kv. and 3,000-Kv. Tests Closely Controlled and Measured

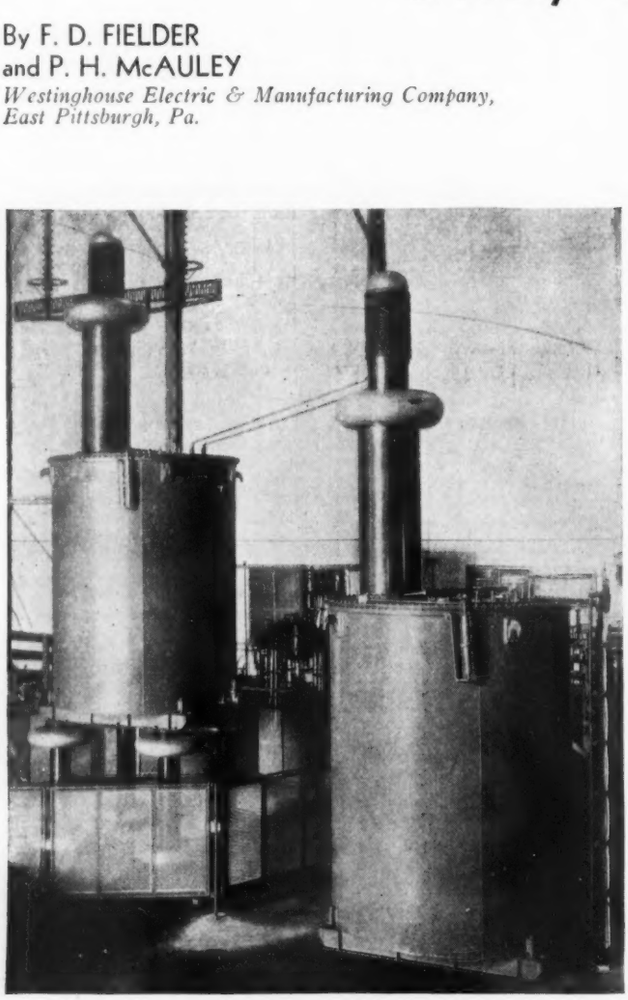
By F. D. FIELDER
and P. H. McAULEY
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

NEW equipment which provides 1,000-kv., 60-cycle and 3,000-kv. surge voltages has recently been installed at the Trafford Laboratory of the Westinghouse Electric & Manufacturing Company. Notable here has been the success which marked the effort to conserve building space and secure greatly improved accuracy in the control and measurement of the voltages generated.

Two 500-kv. transformers, which can be connected in cascade, constitute the new 60-cycle equipment. Since these are to be used primarily for flashover testing, the continuous rating has been limited to 350 kv. per unit to minimize weight and cost. The nameplate data are: 500 kva., 6–1 per cent impedance, 4,600 volts primary, and 250 volts tertiary winding. A third similar unit can be installed when required to give kv. r.m.s. to ground.

Power is supplied either from a synchronous three-phase to single-phase motor-generator or directly from the Duquesne Light Company lines. The voltage can be controlled either through a generator exciter field or by a step induction regulator. When flashover occurs the 4,600-volt circuit is interrupted by an automatic "Deïon" breaker which has proved excellent for the severe mechanical service over a period involving more than 10,000 operations. Either transformer may be supplied from either generator or directly from the power lines, making a very flexible and reliable system.

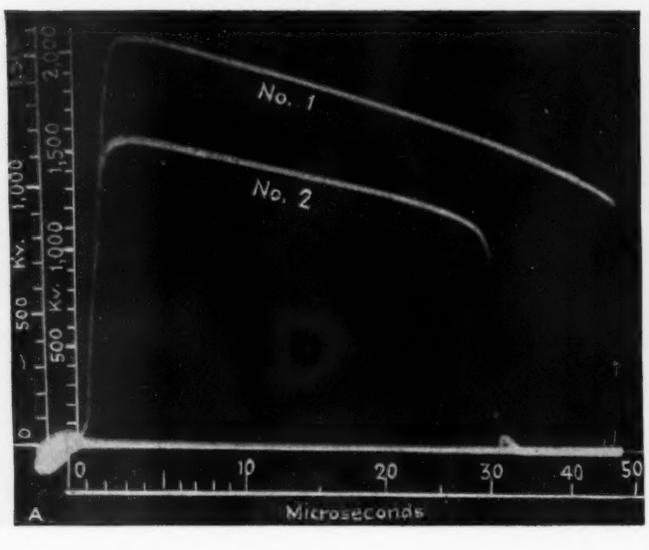
Each 500-kv. transformer has a tertiary winding and

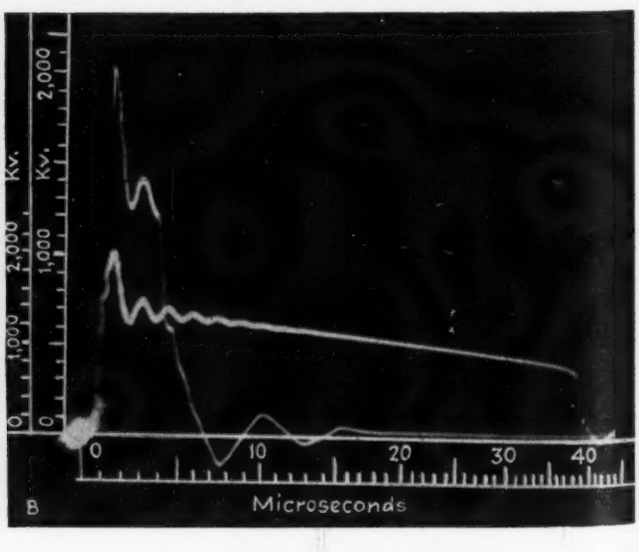


Transformers are insulated from ground for 500 kv. with four micarta tubes

Control of surge wave form improves accuracy of measurements

(A) The normal voltage wave rises to crest value in 1.5 microseconds and decreases to half value in 60 microseconds. (B) Unless the discharge circuit is properly damped, an oscillatory wave, with which reliable measurements are impossible, is obtained.

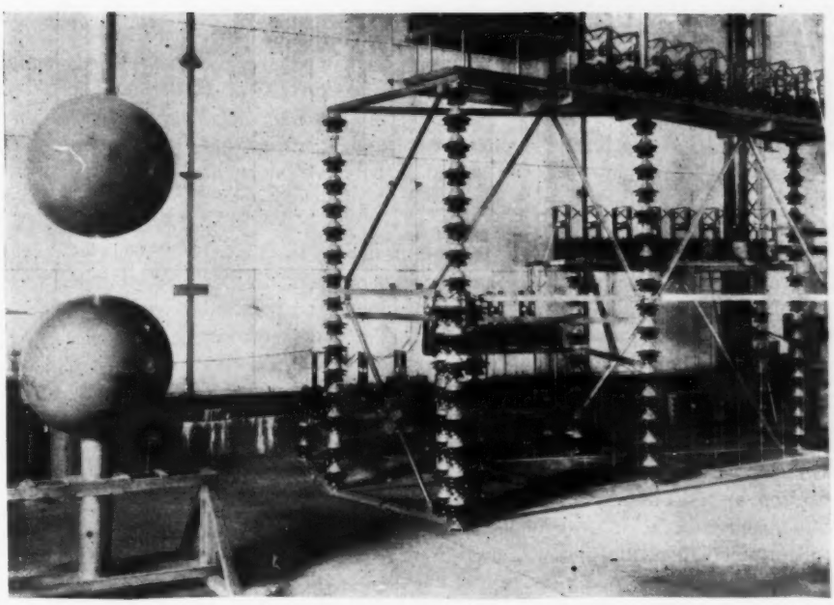




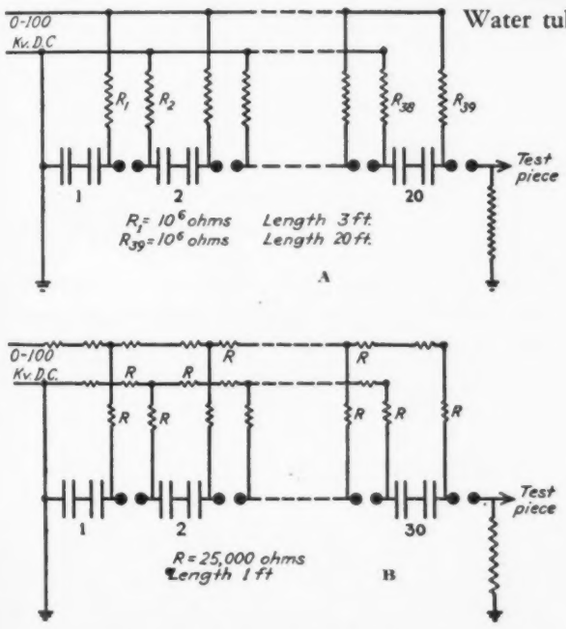
a crest voltmeter connection. A 100-cm. diameter cast brass sphere gap provides a standard for voltage values. Normally, the tertiary winding voltage read on an r.m.s. meter is used for measurements. A small reactance, through which the high-voltage winding current passes to ground, is connected in series with the tertiary winding to compensate for the effect of load on the tertiary winding voltage.

For radio interference testing either transformer at present provides a noise-free source up to 200 kv. By modifying the choke coil terminal the range can be extended.

The new lightning generator is an extension of the 2,000-kv. set installed in 1927. By using only five 10-kv. condensers for each 100-kv.



Water tube resistors have been eliminated from the lightning generator.



Redesign of charging circuits saves laboratory space

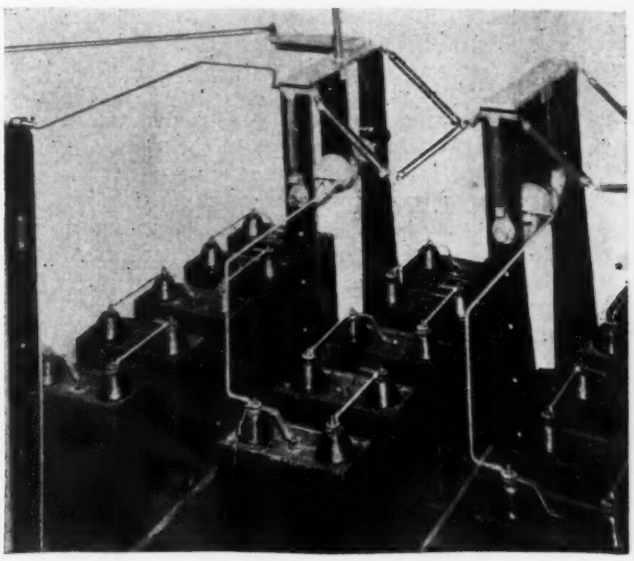
(A) The 2,000-kv. generator parallel charging circuits required water tube resistors up to 20 ft. in length (B) The series charging system of the 3,000-kv. generator permits the use of standard 12-in. "Zircon" resistors.

group it was possible to mount the 150 condensers on the old frame with slight additional bracing and insulation. The floor space occupied has not been increased.

The new surge generator consists of 30 groups of condensers arranged to charge in parallel up to a maximum of 100 kv. d.c. and to discharge in series. Modifications in the charging system permit the use of standard 25,000-ohm "Zircon" resistors in place of the long water tubes formerly used. Since changes in output voltage require adjustment of the intergroup gaps, these have been made adjustable from the floor by means of strings.

The 150 condensers, rated at 0–5 mfd. each, give a capacity of 0.0033 mfd. with the 3,000 kv. connection. This is more than ten times the capacity of a high-voltage condenser bushing. However, when testing large power transformers the voltage regulation will be appreciable. Also, for lightning arrester testing high capacities are desirable. To take care of these requirements arrangements have been made for paralleling condenser groups. Capacities of 0.0133 mfd. up to 1,500 kv. and 0.0266 mfd. up to 750 kv. are available.

Although the capacity has been reduced 25 per cent with the 3,000 kv. connection, a longer wave is obtained than with the old generator, because the new method of charging introduces less leakage to ground when discharge takes place. The normal wave rises to crest value in 1.5 microseconds and decreases to half value in 60 microseconds. The wave front may be lengthened by series resistance in the generator or by inductance. The tail of the wave may be shortened by a parallel load



Condenser and intergroup gap arrangements

resistance. The limit in this respect is a wave which decreases to half value in about 8 microseconds. Below this value undesirable oscillations appear in the wave form. The polarity of the wave may be changed simply by reversing the two charging leads. Ready and accurate synchronization with the cathode-ray oscillograph and consistency in all characteristics on successive applications which make this type of surge generator so desirable have been maintained.

Three checks, two of them independent, are available for voltage measurements. The resistance voltage divider with the cathode-ray oscillograph is the standard method with the 150-cm. gap available as well. A voltmeter on the primary of the charging transformer also indicates the surge voltage, but calibration by one of the other methods is necessary. Experience has shown that unless the generator circuit is carefully damped the sphere gap will indicate voltages up to 30 per cent higher than the oscillograph. The short oscillations which the sphere gap detects have little or no effect on the breakdown of gaps with appreciable time lag. Hence, it is not good practice to use the sphere gap alone as a standard for surge voltage measurement. By proper adjustment of the surge generator circuit agreement between sphere gap and oscillograph values within 2 per cent is obtained, affording a constant check on measuring methods.

Although this equipment does not develop the highest surge voltages heretofore reported, it does provide for the accurate measurement with long waves of voltages in the 3,000-kv. range for the first time. Air gaps up to 20 ft. in length can be broken down. It is estimated that two 5,000-kv. generators rated on the same basis would require at least 35 ft. clearance to ground. Since the laboratory headroom is only 50 ft., any further increase in voltage will necessitate a larger building or an outdoor generator.

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Sequence Control in Sinter Plant Baghouse

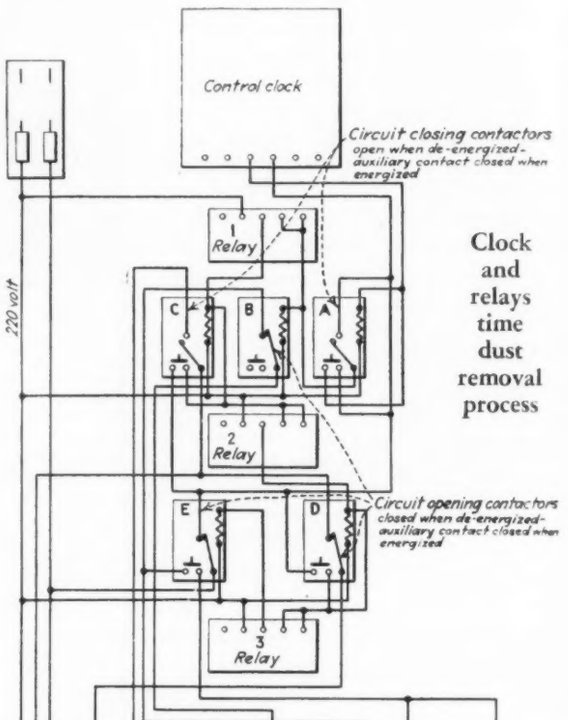
By B. M. DAVIS
General Electric Company, El Paso, Tex.

During 1925 the El Paso smelter of the American Smelting & Refining Company constructed one of the first electrically operated baghouses for removing suspended particles from the gases coming from the lead blast furnaces, sintering machines and converters. The sequence of operation of the fan and shaker motors was controlled by a small cylindrical controller constructed in the electric shop at the smelter.

During the latter part of 1928 the American Smelting & Refining Company constructed two new sinter plant baghouses, one at Amarillo, Tex., and one in Old Mexico. On account of the large number of units involved, the engineers decided to use time-delay relays and contactors. The relays gave more accurate time adjustment for the several stages of the operating cycle.

The wiring diagram shows the connections for one section of one control equipment, as finally built. The equipment has been in operation for more than a year and has given very good service.

The interval between shaking periods is controlled by a clock. When the contact is closed by the clock, contactor *A* is energized and the auxiliary contact seals the contactor. Contactor *A* energizes contactor *B* and relay No. 1. When contactor *B* is energized its contacts open and de-energize the operating coil on the fan-motor control. Relay No. 1, after a definite time delay, closes its contacts 2 and 4 and energizes contactor *C*. When the main contacts of contactor *C* close, the auxiliary contact closes and seals and energizes relay No. 2. The main



Clock and relays time dust removal process

contacts of relay No. 2 close the circuit to the operating coil of the shaker motor control, starting the shaker motor. When relay No. 2, after a definite time, closes its contactors 2 and 4, it energizes contactor *D*, whose main contacts open, de-energizing the shaker motor control, stopping the shaker motor, and the auxiliary contact closes, sealing the contactor and energizing relay No. 3. After a definite time relay No. 3 closes its contacts 2 and 4 and energizes contactor *E*. Contactor *E*, opening its main contact, de-energizes the coils of contactors *A*, *D* and *C*. The auxiliary contact of contactor *E* closing energizes the operating coil of the fan-motor control, starting the fan motor and completing the cycle. Relay No. 1 controls the time interval between shutting down the fan motor and starting the shaker motor. Relay No. 2 controls the running time of the shaker motor. Relay No. 3 controls the time interval between stopping the shaker motor and starting the fan motor.

Experience with Chicago Interchange Contract

By P. B. JUHNKE
Chief Load Dispatcher, Commonwealth Edison Company

Revision of energy charge permits better utilization of most efficient plants.

Treatment of operating costs exclusive of coal.

Revision of line rental charges.

Relay and relay settings subcommittee formed.

IN APPROXIMATE terms, 3,000,000,000 kw.-hr. at a total price of $14,000,000 represents the functioning of the Chicago interchange energy contract during its life of six years so far past. This 3,000,000,000 kw.-hr. is the energy that has been interchanged between the parties to the contract in their mutual efforts to profit from continuously more efficient generating capacity as it has been installed in the Chicago district. Companies in the contract or by interconnection with them affected in greater or less degree by its workings include Commonwealth Edison Company, Public Service Company of Northern Illinois, Chicago District Electric Generating Company, Super-Power Company of Illinois, Illinois Power & Light Company, Indiana Michigan Electric Company, Northern Indiana Public Service Company and others. The principal generating stations that figure in the contract are State Line (C.D.E.G.Co.), Crawford Avenue (C.E.Co.), Waukegan (P.S.Co. of N.I.) and Powerton (S.P.Co. of I.). The Michigan City station of the Northern Indiana Public Service Company, whose first unit was put on the line a short time ago, is a newcomer in this group. To reach and maintain that state of balance in generation and allocation of energy which results in greatest economy to all concerned is the objective of the contract. This objective requires continuous administration of the contract terms by a working committee representing the different companies. It requires also the occasional revision of these terms as conditions change, as new ones arise or as experience adds knowledge to others.

The figures of 3,000,000,000 kw.-hr. and $14,000,000 are, of themselves, impressive, but they do more than impress. They tell a story of the shaping of construction programs of the contracting companies. Large quantities of generating capacity required for urban load have been placed outside of the limits of the cities and where water and fuel conditions are most favorable. The result of this is indicated by the fact that now aproximately 20 per cent of the Chicago peak is carried by out-of-the-city stations and they supply about 30 per cent of the energy used in Chicago. They tell also of transfers of load to the most economical station, irrespective of ownership, and herein lies the contract's greatest benefit.

It might be of interest to inquire as to experience with the form of the contract. During the past five years several changes were necessary. The principal ones were the introduction of the surplus energy charge.

Originally the contract specified that energy be exchanged at the coal cost of the supplying station plus an *R* charge which designated the operating costs exclusive of fuel. This was prohibitive of free interchange, as with the *R* charge, in the vicinity of one mill plus, the cost of energy to the receiving company, even from a most efficient station, was higher than its cost from a less efficient station of its own, where the *R* charge could not be proportionately reduced by reduction in load. The first modification was to the effect that where a company had capacity available to carry its own load, the supplying company might sell energy from idle capacity at full rate plus 0.2 mill. This gave a great impetus to free interchange, as it permitted load to be put on the station where, from an economy point of view, it really belonged. After functioning under this modification approximately four years, another modification was made.

The cost of excess reserve

It was realized that a company building a large excess of generating capacity to supply another company was somewhat at the mercy of the latter company in regard to operating costs. It was supposed to keep its capacity in readiness to supply, but could not always induce the deficient company to take energy at a fair load factor. To correct this a modification was enacted, making a fixed operating cost apply to all excess reserve. This fixed cost was to be the average cost for a given period of four months previous. This compensates, in theory at least, the company having an excess reserve for keeping its capacity in readiness for the company having a deficiency in reserve, even though the latter does not elect to use it. With this stipulation in effect everything disappears except fuel cost as a determinant in the loading of stations of different ownership, with the lone exception of security of service at certain centers where generating capacity is kept running without regard to fuel performance.

Another important change effected was a stipulation

to the effect that when a company having excess capacity supplies interchange line capacity in excess of what is required to make its excess reserve available to the company having a deficiency, a line rental charge shall be paid for such excess line capacity. This was deemed a thoroughly equitable provision, as without it the burden on the supplying company might be excessive, or else it would result in the absence of line reserve so essential to reliable supply.

Another modification recently enacted provides for a reduction of primary charges.

The original charges were:

First 5,000 kw. at $1.50 per kw. per month
Next 10,000 kw. at $1.35 per kw. per month
Next 15,000 kw. at $1.25 per kw. per month
Excess over 30,000 kw. at $1.20 per kw. per month

The modified charges are as follows:

First 20,000 kw. at $1.40 per kw. per month
Next 30,000 kw. at $1.30 per kw. per month
Excess over 50,000 kw. at $1.10 per kw. per mmonth

Operating functions assume definition

Something not contemplated in the original contract, but found highly desirable, consists in the authorization of the operating committee to organize a relay subcommittee and a relay settings subcommittee to assist the operating committee in the discharge of its duties. The operating committee is specifically charged with the designation of relay settings on all interconnections. It is obvious that this work often involves considerations of utmost interest to the engineering representatives of the various companies. Within the confines of the relay subcommittee is offered an opportunity to consider all relay matters pertaining to the entire system. Therefore, it is not only beneficial as an instrument of information, but it also is constituted to act as a co-ordinating agency between the various parties to the contract in all matters pertaining to relays, design as well as settings. A member of the operating committee is chairman of the relay sub-committee, and the chairman of the operating committee is an ex officia member of it. The results obtained to date with the relay committee have been quite satisfactory.

Contract not restrictive on operation

Aside from the very definite specifications for fixed charges and regulations pertaining to billing and payments, the contract affords a maximum of freedom to the administrative agencies, the working committee and the operating committee. These committees are free to handle nearly every situation as the best interests of all concerned dictate. Every member of these committees is, in a measure, his own company's attorney. He is charged with guarding his company's best interests, without losing sight of the broad view that is necessary to arrive at results equitable and beneficial to all. A desirable guide for the conduct of these representatives is that they, thoroughly aware of every phase of situations arising, should in administering the contract take a viewpoint not less broad than that of the higher executives of the various companies who executed it. Fair dealing and co-operation are compatible with such a viewpoint, and results can be had instead of harangue, with distrust eliminated by a maximum portion of reasonableness and good will.

Household Ventilation Electrically Feasible

By FRANK C. TAYLOR
Assistant Manager Industrial Sales Department, Rochester Gas & Electric Company, Rochester, N. Y.

Ventilation of homes holds some interesting load-building possibilities for utilities as well as comfort and economy for the occupant. From a financial point of view the $\frac{1}{6}$-hp. motor running continuously consumes approximately 110 kw.-hr. per month, twelve months in the year, or 1,320 kw.-hr. annually, approximately the same consumption as an electric range, but in the case of the fan motor the connected load is approximately 150 watts running continuously, compared with the 7-kw. electric range with a demand of 5 kw. for approximately the same kilowatt-hours per month.

Ventilation of the home has been held back by the lack of suitable equipment. Motors and fans were noisy and the filters were not readily adaptable to home use. Quiet running motors and fans are now available and these, in conjunction with "V"-groove belt, have solved the noise problem.

In order to demonstrate the feasibility of home ventilation, I installed in the fall of 1928 in my home, a small eight-room house, a motor-driven fan and filter and made use of the warm air ducts as ventilating ducts, supplying clean, warm air in winter and in summer clean, cool air from outdoors. The installation consists of a paper filter made by National Air Filters, Inc., Louisville, Ky., a No. 2½ Buffalo Forge conoidal fan, running at 550 r.p.m. and driven by a $\frac{1}{6}$-hp. General Electric condenser type motor through a "V"-groove belt. The fan, with a capacity of 800 cu.ft. per minute, delivers air into the return duct of the furnace and draws air through the filter, through which, by suitable dampers, air may be recirculated through the house or drawn from outdoors.

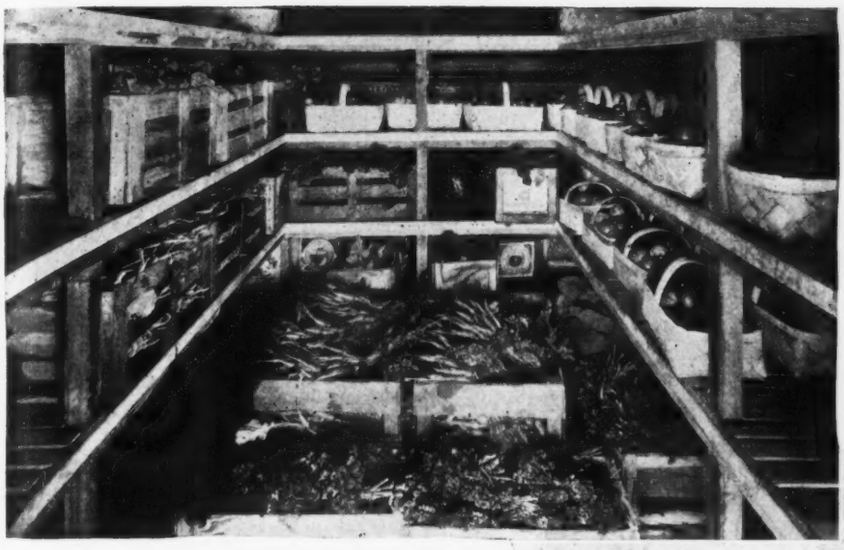
It was found that it was easier to heat the house in winter since the forced air system remedied the situation of insufficient duct capacity for natural circulation. The house was much cooler in summer; in fact, it was possible to be perfectly comfortable in the living room on a hot summer's evening even though all the windows were closed. It was also very noticeable that there was less dirt in the air in the house, which was proved by inspection of the filter after it had been in operation for a month.

It was also interesting to note that in the winter, when all the air was recirculated and no fresh air taken in from outdoors to the inlet of the fan, the amount of dust and dirt in the filter was approximately the same as it was in the summer, when all the air was taken from outdoors.

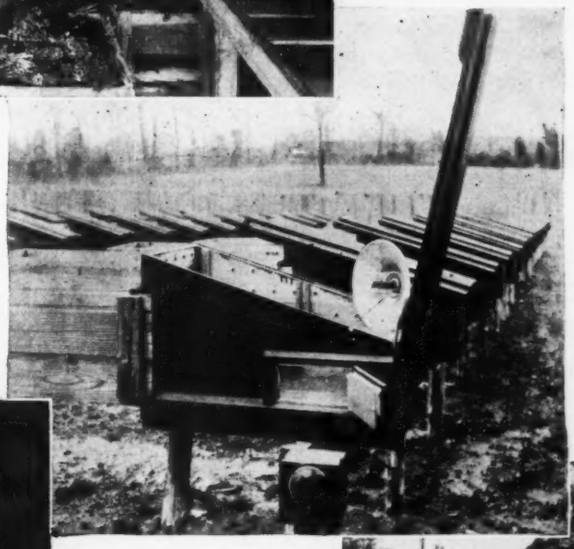
The fan runs continuously day and night, summer and winter, throughout the year, and this operation may easily be justified by a brief inspection of the amount of dust and dirt in the filter, which would otherwise be breathed in by the family. Utilities can well afford to investigate home air conditioning as a prospective load.

Twentieth Century Farming

By E. C. EASTER
Chairman Southeast Division, Rural Electric Service Committee, N.E.L.A.

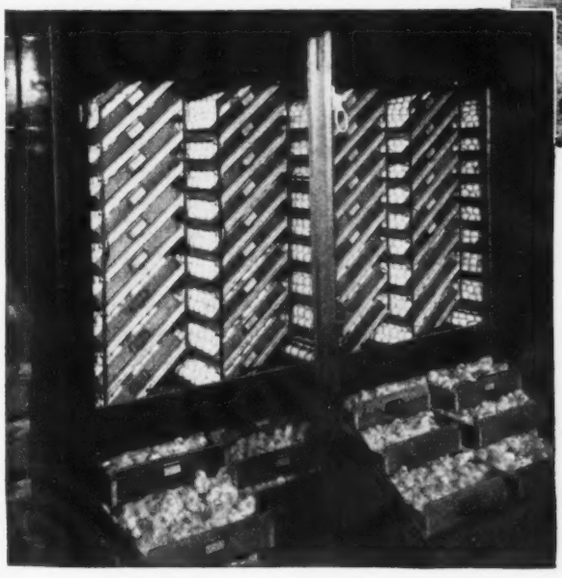


Georgia truck farmer preserves products by electric refrigeration. More than 200 Alabama dairy farms use electric refrigeration



40-watt units heat each of these quail brooder coops. Hundreds of these electric brooders are used on White Oak quail farm near Richmond, Va. Note pilot lamp on row of brooders

80 per cent hatch obtained in this electric incubator near Richmond, Va. Small wattage lamps permit feeding chicks at night without crowding at Roanoke, Va.



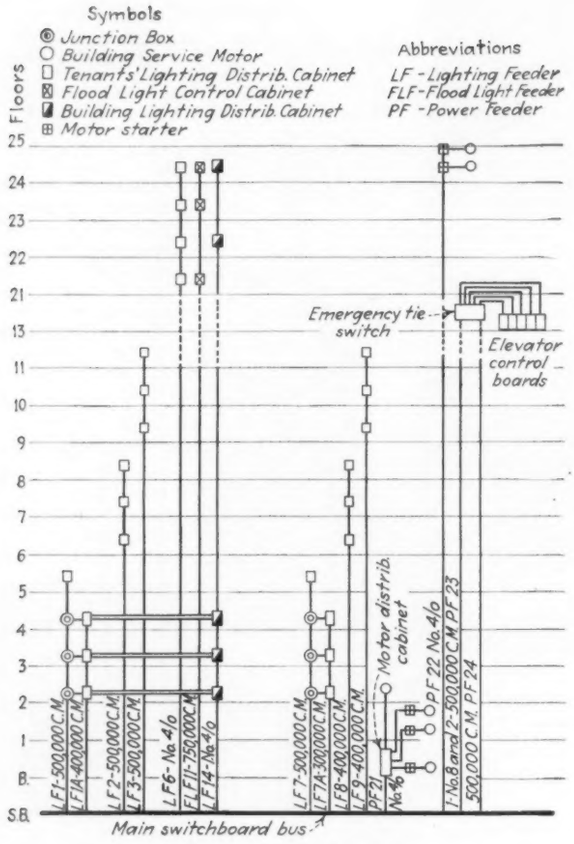
Electric light over pan of oil and water exterminates tomato fruit worm in Mobile County, Ala.

3½-hp. portable motor hoisting hay

In the Southeast are 46,393 farms served by electric service companies, or 28.4 per cent increase in one year. Nearly 24,000 of these farms average 892 kw.-hr. per farm per year, or 26½ per cent increase in one year. One hundred and forty-three farms average 8,430 kw.-hr. per year apiece.

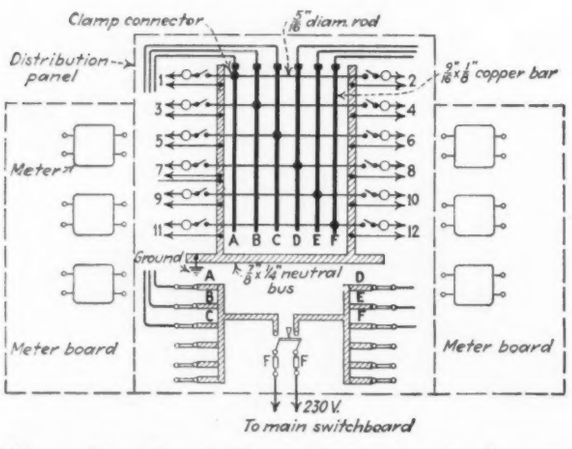
Wiring to Make Tenant Changes Easier

By MAX KUSHLAN



Typical riser diagram

In general, feeders are run in pairs, each pair serving three floors.



Shifting of branch circuits for balancing in distribution cabinets is easily done by clamp connectors

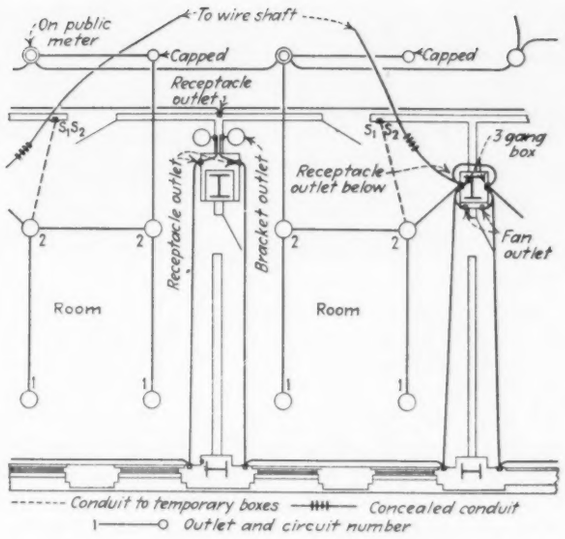
IN THE new office building of the United Shoe Machinery Company at Boston many of the 27 floors are occupied by small tenants and the partitions had to be designed to facilitate changes and extensions in space allocation. This demanded flexible wiring to meet this condition without extensive cutting or patching. Apart from basements, exposed conduit work is out of the question in a building of this type. As an alternative, sufficient additional concealed conduit work had to be provided to take care of future changes without having to disturb the main wiring or to mar the present appearance. Flexibility and finished appearance determined the grouping of main feeders, the wiring of branch distribution cabinets and of floodlight units around the towers.

Energy is supplied by four Edison three-wire, direct-current, 1,000,000-circ.mil service feeders, each rated at 1,000 amp., 230-115 volts. Maximum building load can be supplied with one of the service feeders out. This energy is distributed from a switchboard in the basement. After passing the Edison meters, which are connected across each outside lead and neutral, the total energy is sub-metered to separate the amounts used in public lighting, for building service power and for power and lighting in the owners' premises.

The main feeder cables are grouped in the rear of the switchboard, where they are carried under the basement ceiling on insulators supported on steel framing and are housed in sheet steel plate, with the side facing the rear of the board left open. This gives easy access for inspection and changes. From the cable inclosure the feeders are carried in rigid iron conduit to two riser shafts extending between the second and fifteenth floors. From there to the top floor the risers are carried in a single shaft.

Power for lighting circuits is distributed by twenty feeders, of which one is assigned to corridors; two risers feed the floodlight circuits, three are connected to the store cabinets and the rest are used for office lighting. These are grouped in pairs, each pair feeding three floors on the average, as shown in the typical riser diagram.

To provide for an anticipated increase in lighting load on the second, third and fourth floors additional feeder capacity may be supplied by tapping the two feeders now serving the fifth floor. These taps can be made in junction boxes inserted on the second, third and fourth floors in the two conduit risers going up to the fifth floor. A short conduit connection between a box on each of the lower floors and the nearest cabinet permits an increase in branch capacity. Additional capacity and flexibility



Typical temporary and permanent outlet connections at floor columns

for all locations involving partition changes and capped outlets in tenant spaces.

are provided by cross-connections between one of the lighting feeders serving the lower floors and the corridor lighting feeder.

Eight power feeders connected across the outside distribution buses serve various building requirements. These include stokers, ash and coal conveyors for the emergency building steam plant, used as a stand-by for building heating in case of failure of steam supply from the Edison system. These feeders also energize motors for running pumps, ventilating fans, sewage ejectors, compressors, etc., also ten passenger and one freight elevators. Five of the elevators are operated between the first and thirteenth floors, where the elevator control panels for these cars are located. These panels are fed by two parallel risers which are cross-connected through an emergency switch to insure continuous service. Three passenger elevators are terminated and controlled at the twentieth floor and the remaining machines are run up to the top floor. This provides a choice of local or express elevator service. These elevators are of the automatic pre-registered type, the operator pushing a button for closing the doors and another button for a stop at any floor.

Branch wiring for lighting is distributed from three-wire mains to two-wire branches in distribution cabinets equipped with separate metering panels, as shown in a typical cabinet diagram. Connection between the vertical busbars and horizontal branch conductors in the form of solid round rods are made with removable clamp connectors. This provides flexibility in connecting any pair of branches to a bus tied to either of the outside wires of the three-wire feeder. A shift of a branch from one side to the other for better balancing can be made without any other change than a relocation of a clamp connector.

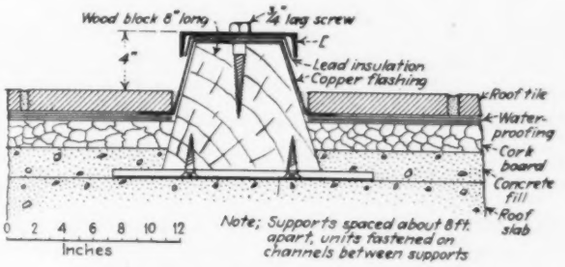
The location of meters on separate panels on the two sides and outside of the cabinet proper permits additions and changes in metering without involving major changes in cabinet wiring. The cabinets are made by the Worcester Electric Manufacturing Company.

Lighting branch wiring

To avoid disturbing the present conduit when making changes and adidtions in office areas, the permanent switch and plug receptacle boxes are placed on columns and on outside walls, as shown in the conduit plan and elevation. Some of the present switches, which are temporarily located at convenient points on partitions, may be removed and permanent switches installed in extra boxes provided for them without disturbing most of the wiring.

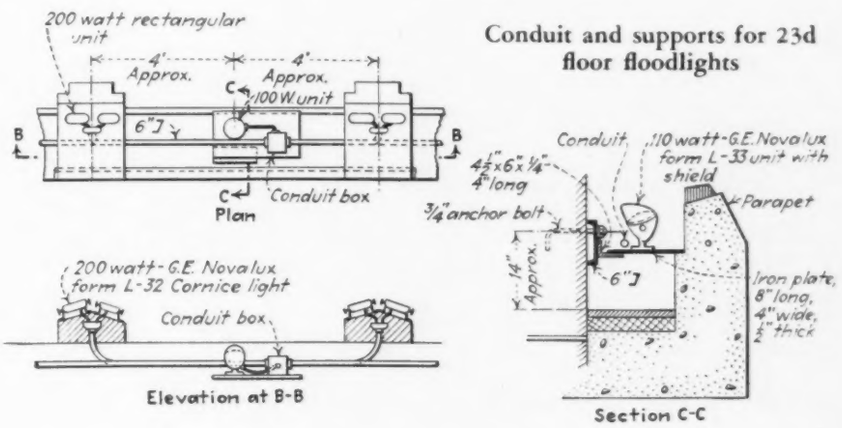
Anticipating changes in office arrangements which will include areas taken by present corridors, conduits for corridor wiring have a number of duplicate outlet boxes. One set of these, wired for present use, is now connected to the public meter. The second set of corridor outlets is now capped and concealed behind the plaster, but is connected by conduit to the tenants' circuits. These are arranged to be ultimately controlled from the permanent switch boxes, as indicated in the conduit plan.

In harmony with the architectural treatment of the towers, the upper floor exteriors and roof are floodlighted by concealed units placed around the recesses on the 21st, 23d and 24th floors and on the roof. The setback at the 21st floor is equipped with 33 projectors, each rated at 1,000 watts and provided with stippled lenses. Support for the floodlighting units on this and on the 24th floor setbacks is provided by continuous 6-in. channels resting on wood blocks spaced about 8 ft. apart, as shown in detail in the drawing. This gives a cushioning effect



Detail of channel supports for floodlight units

on 21st, 24th and 25th floors.



Conduit and supports for 23d floor floodlights

and helps to level the unit bases on the sloping surfaces of the setback areas. The 24th floor exterior is illuminated by 29 250-watt floodlight units. On the 23d floor the method of floodlighting and supports had to be adapted to the narrow space between tower and parapet and sloping faces of the stone cornices. Illumination on this floor is provided by a combination of 25 100-watt small round units provided with shields to screen the light beams from the windows and 58 200-watt cornice lights of rectangular shape to conform to the architecture. The four corners on the 23d floor are intensified by the aid of 250-watt projectors. The smaller units on the 23d floor are placed on plates which are fastened by angles to a continuous channel iron anchored to the structure wall as shown in plan, elevation and section.

Roof lighting is provided by 26 1,000-watt floodlights, so placed and directed as to produce a pleasing "scalloped shadow" effect at the bottom line of the pyramidal roof. Part of this directed light projects beyond the truncated top, intensifying the upper part of the flagpole. The lower part of the staff is brought out by light from three 250-watt projectors located on the penthouse roof.

The types of floodlighting units and details of their supports were developed by Hollis French & Allen Hubbard, the electrical engineers for this building, in collaboration with the engineers of the General Electric Company, who furnished the floodlighting equipment.

▼

Southeastern N.E.L.A. Stimulates Architects

Award of prizes is announced by C. M. Kilian, executive secretary Southeastern Division, N.E.L.A., in a lighting and wiring competition for architects recently concluded within the states of Alabama, Georgia, Florida, Tennessee, Virginia and North and South Carolina. The judges were M. H. Furbringer, director American Institute of Architects, Memphis; L. W. Davis, general manager Association of Electragists International, New York City, and J. M. Ketch, lighting engineer, National Lamp Works, Nela Park, Ohio. Awards offered totaled $3,150, and the competitors were divided into seven groups as follows:

I. For the best-wired residence, total construction cost not in excess of $12,500—First prize, $500; second, $250; third, $100.

II. For the best-wired residence, total construction cost more than $12,500—First prize, $350; second, $100; third, $50.

III. For the best-wired apartment building, four units or more—First prize, $250; second, $100; third, $50.

IV. For the best-wired and lighted retail establishment (any size) with display windows—First prize, $250; second, $100.

V. For the best-wired and lighted office building of five floors or more—First prize, $250; second, $100.

VI. For the commercial building with the best exterior electrical displays and decorative lighting, including electrical advertising suggested by the architect—First prize, $250; second, $100.

VII. For the best-wired and lighted factory building of 40,000 sq.ft. or more—First prize, $250; second, $100.

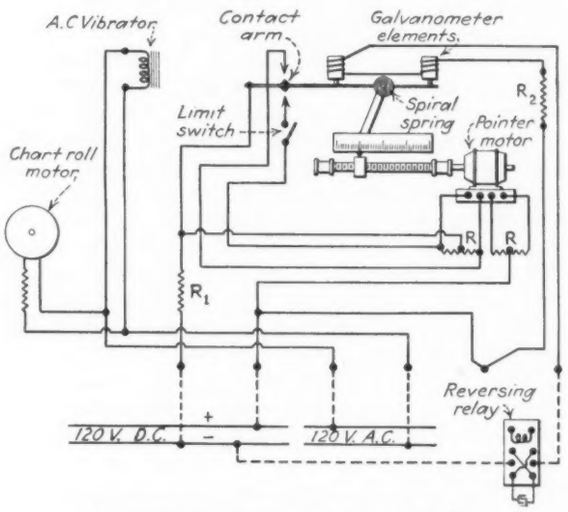
No awards were made in Group III and Group VII, and no second prize was awarded in Group V and Group VI. The ten awards made were for buildings in Memphis, Tenn.; Valdese, N. C.; Virginia Beach, Va.; Miami, Fla.; Jacksonville, Fla.; Camden, S. C.; Norfolk, Va.; Charlotte, N. C.; Atlanta, Ga., and Greenville, S. C.

Rebuilt Meters Save Space on Dispatcher's Board

By URIAH DAVIS
Assistant Chief Load Dispatcher
Commonwealth Edison Company, Chicago, Ill.

Ten impulse-operated graphic instruments that by a remote-metering system record the output of generating stations on the load dispatcher's board of the Commonwealth Edison Company have been rebuilt to occupy only one-half of the space that they covered before. Recently the office of the load dispatcher was enlarged and rearranged and this furnished an occasion for extensive revision of the recording instruments of the remote-metering system, with the result that these instruments now occupy an area of only 8½ sq.ft. on the system's diagram board in comparison with the 17 sq.ft. formerly required. In the old installation the operator in charge of power house load control was forced to get up from his desk and go to each meter to read it. Now all meters can be read easily from the desk position.

The remote-metering system as it was originally in-



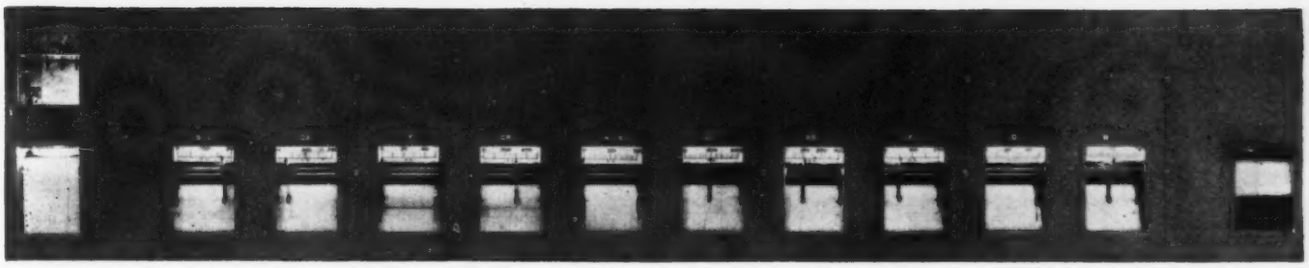
Original remote-metering recorder

This sketch shows the mechanically balanced recorder originally installed. The received impulses actuate the reversing relay, which, by means of the condenser, for each impulse received sends two to the galvanometer. The sum of impulses in the galvanometer, smoothed out by a glycerine dashpot, tends to raise the contact arm and start the pointer motor in such a direction as to move the pointer and recording pen on the threaded shaft up the scale.

As the pointer moves up the tension of the spiral spring is increased and a greater sum of impulses in the galvanometer is required to hold the motor contact closed. A state of balance in which the spring and galvanometer torques are equal stops the motor and leaves the pointer at an indication of the measured load.

As the load decreases and the impulses to the galvanometer are lessened in number the spring tension depresses the contact and connects the pointer motor in reverse and the pointer moves down the scale to a new balance. The limit switch stops the motor and prevents throwing the spring belt drive in case the zero adjustment is in error.

The chart roll motor is a synchronous unit. In the revised installation, as explained in the following sketches, the individual record roll drives and the mechanical balance between the pointer and the galvanometer are eliminated.



System loads at a glance

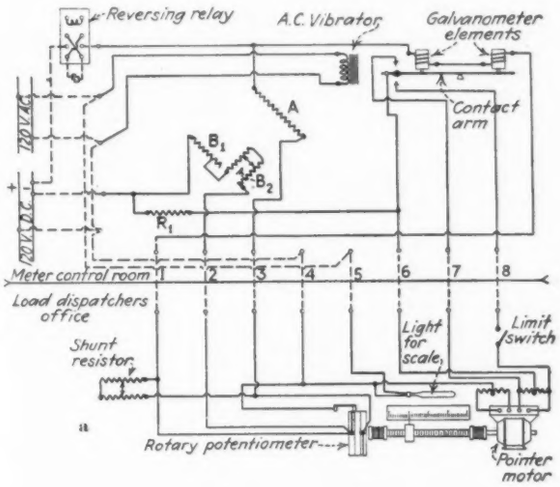
This installation of power house output remote-metering instruments placed along the bottom of the dispatcher's board is compact enough so that the load control operator of the Commonwealth Edison Company can watch the performance of generating stations without moving from his desk. At the left the upper meter shows the integrated time error in system frequency. Below is a graphic meter showing energy interchange between 25- and 60-cycle systems. The next five are recorders of 60-cycle generation in separate stations, next is the total of 60-cycle energy, next 25-cycle total, next three separate 25-cycle generations and last a frequency indicator.

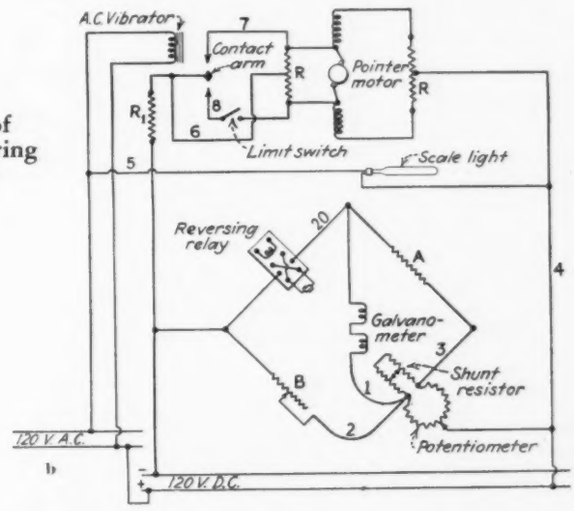
stalled was described in the ELECTRICAL WORLD of June 18, 1927. The meters had the galvanometer element, recording chart, timing mechanism and reroll all in one case. As they now operate the galvanometer elements are separated from the recorders, which alone appear on the board. The galvanometers, relays and other associated equipment are located in a separate room, thus removing the noise of their operation from the dispatcher's office and making it much easier for the operators to concentrate on their work.

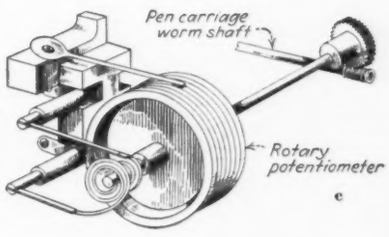
The separation of the heavily damped ballistic galvanometer (milliammeter) from the recording mechanism required the replacement of the original variable spring-tension balance between the two units by some other means. A potentiometer laid in a spiral on a narrow drum geared to the curve-drawing element furnished this means. This resistance is connected in the variable section of a bridge balance as is shown in one of the accompanying diagrams.

The bridge-calibrating resistances are arranged in such a manner that they can be varied by means of a screw arrangement. The bearings in the recording mechanism were all replaced with ball bearings and the dials replaced with illuminated dials. All of the chart drums of the recorder mechanisms were assembled in line and mechanically connected so that all are driven by one timing motor of sufficient capacity to eliminate the trouble that frequently occurred with the small clock motors in the original meter assemblies.

Revision of remote-metering recorder







Sketches (a) and (b) are identical electrically; (a) is the arrangement of parts to indicate the separation of elements and to show mechanical relations; (b) is a simplified electrical diagram to facilitate the explanation of operation, (c) is a detail of the rotary potentiometer.

Under no load the reversing relay is open, the recorder shows zero and the potentiometer resistance is on that side of the bridge, in series with resistance (*A*), so as to prevent more than a very minute current, not sufficient to operate, in the galvonometer. The reversing relay starts sending impulses which divide between the paths afforded by the galvonometer and the resistances on the positive side of the bridge. The contact arm, its movement smoothed by the glycerine dashpot, moves up to make the forward motor connection.

The pointer motor drives the pointer up the scale and also turns the potentiometer drum in sketch (c), so that potentiometer resistance is transferred to the other side of the bridge. This change increases in the galvanometer, the current flowing through the resistance (*B*) and (*A*), which is opposite in direction to the impulse currents. A point is reached on the scale and on the potentiometer at which the opposing impulse and steady currents in the galvanometer are in balance; the contact arm returns to center and the drive motor stops. Rotary potentiometer makes 2.8 revolutions from zero to full scale reading of recorder.

Changes up or down in the frequency of impulses disturb this balance and cause the drive motor to start forward or backward. The alternating-current vibrator serves only to oscillate slightly the contact arm so that it will not stick. The synchronous motor drive for the record chart is missing from this design. Its place is taken by a single motor which drives the charts of all ten instruments on the dispatcher's board.

Reclosing-Breaker Practice of 35 Companies

(Information collected by Electrical Apparatus Committee, N.E.L.A.)

Co.	Type Service*	Reclosing Duty Cycle (Seconds)	Trend of Practice on Initial Reclosure	Percentage of Times Service Is Restored After Reclosures			Attitude on Initial Reclosures Within 2.5 Seconds
				1st	2d	3d	
1	R. P. and L. I. H. v.	4– 15– 15 60– 60– 60 60– 60– 60 60– 60– 60	Decrease initial reclosure; increase succeeding ones.	85	6.5	2.3	Favorable. Successfully practiced in several instances.
2	R. P. and L. I. H. v.	30– 60– 90 30– 60–120 120– 120 120– 120	Decrease.	Not available.			Practice doubtful.
3	R. P. and L. I. H. v.	0– 30– 60 0– 30– 60 0– 30– 60 None	No change contemplated.	53.8	15.2	5.5	No data relative to this practice available.
4	R. P. and L. I. H. v.	15– 30– 75 15– 30– 75 15– 30– 75 None	No tendency to change.	81.5	10	0	Service does not require this practice.
5	R. P. and L. I. H. v.	15– 30– 75 15– 30– 75 2.5– 42– 74 15– 30– 75	Decided tendency to decrease initial reclosure. 2.5–42.5–75 cycle preferred.	92	6	2	Favorable. Time-delay undervoltage protection to customer's control equipment essential
6	R. P. and L. I. H. v.	0– 0 0– 0 0– 0 0	Instantaneous reclosure desirable for service reasons.	70	3	....	Favorable.
7	R. P. and L. I. H. v.	60– 60– 60 60– 60– 60 180–180–180 30	Present practice satisfactory.	75	8	5	Under consideration.
8	R. P. and L. I. H. v.	30– 30 30– 30 None None	Present practice satisfactory.	No data compiled.			Time delay U.V. releases used by customers, but not with view of reducing initial reclosure.
9	R. P. and L. I. H. v.	2.5– 15– 15 2.5– 30– 60 15– 60– 60 30– 60– 60	Change to 2.5–60–120.	91.0	4.4	.2	Favorable.
10	R. P. and L. I. H. v.	15– 30– 75 0– 30– 75 0– 30– 75 15– 30– 75	Reduction of initial reclosure without effect on succeeding ones.	90	9	1	Quite desirable.
11	R. P. and L. I. H. v.	15– 30– 45 15– 30– 45 15– 30– 45 15– 30– 45	Decrease all intervals.	75	15	10	Favorable.
12	R. P. and L. I. H. v.	15– 45– 75 15– 45– 75 15– 45– 75 15– 45– 75	Initial reclosure on res. and ind. services may be reduced.	60	15	5	Doubtful.
13	R. P. and L. I. H. v.	15– 30– 75 15– 30– 75 None 15– 30– 75	Decrease initial and relatively increase succeeding.	95	2	0	Favor immediate initial with one 30-second following.
14	R. P. and L. I. H. v.	30– 30– 60 15– 30– 75 15– 30– 75	Tendency to reduce residential cycle to 15–30–75	90	1	....	Practical.
15	R. P. and L. I. H. v.	15– 30– 75 15– 30– 75 15– 30– 75 15– 30– 75	No change. The 15–30–75 cycle favored.	94	5	1	Unfavorable. Liable to damage product manufactured.
16	R. P. and L. I. H. v.	15– 30– 75 15– 30– 75 15– 30– 75 15– 30– 75	Present practice satisfactory.	Not available.			Unfavorable because of heavy duty on switch.
17	R. P. and L. I. H. v.	15– 30– 75 15– 30– 75	No change anticipated.	Not available.			Appears practical and worthy of trial.
18	R. P. and L. I. H. v.	15– 30– 75 15– 30– 75 15– 30– 75	Decrease initial reclosure without effect on succeeding ones.	†	†	†	Favorable. Might require abnormally large switch.
19	R. P. and L. I. H. v.	15– 30– 75 15– 30– 75 None None	No tendency to change.	50	35	15	Favorable. Every effort should be made to encourage this practice.
20	R. P. and L. I. H. v.	15– 30– 75 15– 30– 75 15– 30– 75 None	No change anticipated.	60	35	5	Undesirable for the present.
21	R. P. and L. I. H. v.	45– 45 45– 45 None None	No change anticipated.	10	0	Not used	Favorable. Emergency transfers made in three seconds satisfactory.
22	R. P. and L. I. H. v.	15– 45– 75 30– 60– 90 30– 60– 90 30– 60	No changes made recently.	95	5	0	Favorable, if practical.
23	R. P. and L. I. H. v.	15–120–600 15–120–600 15–120–600 15–120–600	Present practice satisfactory.	95	33	1.7	Service does not require this practice yet.
24	R. P. and L. I. H. v.	15– 60 15– 60 30– 60	Decrease time interval. Also, number reduced from three to two.	75	2.5	‡	No experience, but see no practical objection.
25	R. P. and L. I. H. v.	15– 15 15– 15 15– 15 None	Decrease number of reclosures and increase interval.	....	....	....	Impractical with present equipment and layout.
26	R. P. and L. I. H. v	15– 30– 75 15– 30– 75 15– 30– 75 60– 60	Present practice satisfactory.	90	6	4	Might materially increase cost of breaker, but might be justified if service warranted.
27	R. P. and L. I. H. v	8– 45–120 15–120 15–120 None	No experience.	78	6	0.99	Maximum permissible delay for undervoltage releases found to be 1.5 seconds.
28	R. P. and L. I. H. v.	15– 60–120 15– 60–120 15– 60–120 15– 60–120	Tendency to decrease.	70	20	10	Very desirable.
29	R. P. and L. I. H. v.	15– 30– 75 15– 30– 75 15– 30 None	Present practice satisfactory.	Not available.			Appears desirable; however, complications might be involved.
30	R. P. and L. I. H. v.	15– 30– 50 15– 30– 50 15– 30– 50 15– 60	Decrease initial and double time of succeeding.	70	15	1	Favorable. Load transfers now made in less than 2.5 seconds.
31	R. P. and L. I. H. v.	15–120 15–120 15–120 15	Equipment limits initial reclosure to 15 sec. min.	¶	¶	¶	May be practical.
32	R. P. and L. I. H. v.	5 5 15 60	No change contemplated.	80	....	....	Should cause no ill effect except in special cases as paper mills, grain elevators, etc.
33	R. P. and L. I. H. v.	15– 45–120 15– 45–120 15– 45–120 90– 90– 90	No change anticipated.	80	10	5	Desirable for certain types of load.
34	R. P. and L. I. H. v.	30– 30– 30 30– 30– 30 None None	Experience limited.	100	....	....	No experience. Expect trouble on elevators.
35	R P. and L. I. I. v.	5– 30– 60 5– 30– 60 15– 30– 60 30– 30– 60	Decrease without effect on time of succeeding reclosures.	69 §	5 §	0 §	Favorable

* R = Residential; P. and L. = power and light; I = industrial; H. v. = high voltage. † Not sufficient data available. ‡ Negligible.
¶ Ten per cent of tripouts result in lockouts. § Seven per cent of lockouts from feeder trouble, 19 per cent from mechanical defects.

Network Switch Failures Controlled*

Balancing transformers helpful.

Light load periods watched.

Voltage regulation excellent.

Protective grounds guard men against back feeds.

Lessons of nine years' operation.

By C. W. FRANKLIN

Superintendent Transmission and Distribution Department, United Electric Light & Power Company, New York

ON JANUARY 1, 1931, 98.5 per cent of the total 60-cycle distribution transformer capacity in Manhattan was in network service, with 1,820 protectors in automatic operation in connection with 291,000 kva. of transformers. Sixty 3,000-volt and 50 13.8-kv. feeders handled this service, 208,000 kva. being on the higher voltage feeders. All lighting service on the company's distribution system is supplied from networks, the system being three-phase, four-wire, with 120 volts for lighting and 208 volts for power. The initial installation went into operation in April, 1922. The company distributes all the 60-cycle energy sold on Manhattan Island and south of 135th Street its service parallels the direct-current service of the New York Edison Company, with which it is affiliated. The reliability and efficiency of the service are such that the company intends to build no more substations and it plans to meet increment loads by installing high-voltage transformer capacity supplied directly from station feeders. The principal lessons of the past nine years' experience which have led to improved methods of operation are given below.

Several types of network protectors used

The distribution transformers are located in vaults located on the consumers' premises, either in the building proper or preferably under the sidewalk. Transformer banks on the 13,800-volt feeders are of 150, 300, 450 and 600 kva. capacity, with one installation under construction where 1,000-kva. banks are planned. While the use of polyphase transformers is increasing, the majority of the transformers used are single phase. The transformers are rated 13,750 to 125 volts with taps at 13,406 and 13,063 volts and 5 per cent inherent reactance. All high-voltage transformers have a subway type of high-voltage terminal, thus allowing the lead sheath street cables to be connected directly to the transformers.

As the company has been using network protectors since 1922, it has a considerable number of types in service. The protectors used on transformer banks of 450 kva. and larger are the present standard type non-submersible, motor-operated, shunt-trip network protectors, with silver-plated butt type contacts. These protectors are equipped with three-phase operating relays and phasing relays. Phasing relays are used on all 13,800-volt installations. The protectors are also equipped with a reactor cut-out relay for increasing the reverse current trip setting of the operating relay. This reactor cut-out consists of a reactor shunted across each current transformer of the protector and a relay which is set to pick up with 150 per cent rated full load of the protector flowing through it. When the cut-out relay picks up it opens the reactor circuit and thus allows the operating relay to trip quickly, which is desirable during primary faults. The complete reactor cut-out relay assembly is mounted on the current transformer. These reactor cutout relays are only used when it is desirable to make the operating relays insensitive. At present approximately 20 per cent of the network protectors are insensitive.

With 300-kva. banks 800-amp. protectors are used. These may be either motor or solenoid operated, shunt trip, with silver-plated butt type contacts.

With 150-kva. banks 500-amp. protectors are used. These protectors are all solenoid operated and have copper brush type contacts with carbon arcing tips. Some are arranged for no-voltage trip and some for shunt trip operation.

Voltage regulation close

In the metropolitan area it is considered essential to maintain the alternating-current network voltage, under normal conditions, between the limits of 118 and 126 volts at the consumer's service. If 2 volts drop is allowed in the consumer's wiring 116 to 124 volts is the range at the lamps.

While these are the actual maximum and minimum limits, in practice the vast majority of services have much closer regulation, as can be seen from the following data for 1930:

Number of check readings at distribution transformer secondaries	17,184
Average voltage	122.08
Number of check readings at services from street mains	10,949
Average voltage	121.50
Distribution transformer secondaries:	
Per cent readings below 120 volts	2.54
Per cent readings above 124 volts	0.02
Per cent readings above 123 volts	5.24
Services from street mains:	
Per cent readings below 120 volts	7.05
Per cent readings above 124 volts	0.00
Per cent readings above 123 volts	3.39

**From a paper before the Engineering Section, New England Division, N.E.L.A.*

We have found that increment starting of large motors eliminates flicker conditions. While considerable latitude in the amount of starting current is permissible under certain conditions, the increments in starting current are normally limited to 100 amp. plus 1 amp. for each kilowatt of demand. This latter is based on the highest half-hour integrated demand on the service to which the motor is connected, as determined by the company. Another limitation is that the starter will not open the circuit during the entire starting operation. For installations of 400 kw. demand and above special consideration is required.

As an illustration of this type of starting, at one installation in Manhattan there is installed a 450-hp. synchronous motor together with a number of smaller motors. The present transformer installation consists of three 300-kva. banks. The starting of the 450-hp. motor is in five steps. The total variation in voltage is 6½, but the largest drop at any time is 2 volts, which causes no noticeable flickering of lights.

On installations similar to the one described, where several transformer banks are paralleled on a solid bus, balancing transformers are used as reactance instead of iron core reactors. The balancing circuit requires a balancing unit in each transformer secondary and the secondaries of these balancers are so interconnected as to present maximum reactance to circulating currents, but minimum reactance to the path of normal load currents.

The balancing circuit gives good voltage regulation under all system conditions, with only a small voltage drop for a given motor-starting current, and causes each transformer bank to carry its share of the load, and thereby reduces circulating current on unbalanced feeds to a negligible amount. With these balancers sensitive network protectors are used.

Troubles do not affect service

We have had many cases of faults on primary cables, transformers and secondary network mains, but in no such case have we had anything more than the few local interrruptions which were due to the destruction of secondary cables supplying the local load, in the process of the network excercising its self-clearing functions. In other words, there are plenty of troubles with networks, but they do not affect service or the public, and while the engineer is just as busy as ever, he is relieved of the responsibility of explaining causes for inadequate service.

In 1928 there were 52 faults on 13,800-volt cables and joints, 95 faults on 3,000-volt cables and joints, 49 faults on secondary cables and joints and two failures on 13,800-volt transformers. All but two of the faults on primary cables and joints cleared without blowing fuses in any network protectors. All but one of the 49 faults on secondary cables and joints cleared without blowing fuses.

In 1930 there were 113 faults on 13,800-volt cables and joints, 98 faults on 3,000-volt cables and joints, 53 faults on secondary mains and twelve failures on 13,800-volt transformers. Network protector fuses blew on nine of the faults on primary cables and joints and on two of the secondary faults. Fuses blowing on primary faults were caused by the protectors not opening due to some mechanical trouble.

We estimate that more than 50 per cent of the failures occurring on the network protectors are indirectly due to excessive protector operations either during light load periods, or on protectors installed in new buildings where a relatively large transformer capacity has been installed but on which the load is small. During such periods of light load the transformer voltage at times lags the network voltage due to system conditions. If the protector is not equipped with a phasing relay a periodic closing and opening or "pumping" condition is set up. With the phasing relay installed the protector is held open and then trouble is often encountered with motors starting and causing the lights to flicker.

In tall buildings elevator installations generally use the Ward Leonard system of control, which depends upon regenerative braking for stopping the cars. With the load on the installation this back feed into the supply does not affect the network protector, but during light load periods the back feeds are large enough to open the network protectors. This may leave the installation with only the street or interbuilding secondary tie in service. Of course the protectors will reclose again after the back feed, but the resulting low voltage when the protectors open is likely to cause circuit breakers on other apparatus with low-voltage releases to trip out and the lights to flicker. Another condition that occurs during light load periods is the opening of some of the protectors due to the network voltage at these locations becoming slightly higher than the transformer voltage. Under such condition the phasing relay may be closed, but the three-phase operating relay remains open. Any fluctuating load in the vicinity, such as an elevator, will drop the network voltage enough, on starting, to cause the three-phase relay to close. This results in a pumping condition.

To remedy these conditions it was necessary on several installations to make the protectors insensitive by means of reactor cut-out relays. By the use of balancing transformers on multiple bank installations the operation of network protectors during light load periods has been improved so that in all except a few instances sensitive protectors can be used. There are in service at the present time more than 300 balancer installations on our system.

The other troubles occurring on network protectors are caused by mechanical troubles, such as friction in the relay or operating mechanism, etc.

Switch failures sharply reduced since network installation

Due to the United Electric Light & Power Company operating a network system through the development period our operating record of switch failures is doubtless higher than would be found in companies which have only recently installed network systems. Between April, 1922, and January, 1931, the network protectors on the system are recorded with a total of 516,642 switch operations, half of these being closing and the other half opening operations. During this same period there were 955 failures, 365 of this total being failures to open and 590 being failures to close. The total failures based upon protector operations amount to 0.184 per cent. Failures to open amount to 0.141 per cent and failures to close amount to 0.228 per cent. The protector operations upon which the failures are based are those occurring when a feeder is cut out or cut in service. Pumping and test operations are not included..

From 1924 to 1931 the per cent of total failures per year has been as follows:

Year	Per Cent Total Failures	Year	Per Cent Total Failures
1924	1.10	1928	0.140
1925	0.222	1929	0.133
1926	0.231	1930	0.1735
1927	0.206		

The increase during 1930 was due to the elimination of the practice of cutting various feeders out of service during light load periods. As the comparison of failures, based upon a percentage of the protector operations, is not an entirely suitable method of comparison, the number of failures per switch per year of service is also being recorded.

From 1926 to 1931 the number of failures per switch per year of service is as follows:

1926	0.772	1929	0.125
1927	0.400	1930	0.106
1928	0.177		

When the failures are compared this way a marked improvement in operation each year is noticed.

One of the major problems on networks is the protection to men working on the high-voltage feeders. When a feeder is taken off to be worked upon grounds are placed on the feeder at the station and at locations on each side of the point at which work is to be done. To place the grounds on the feeder outside of the station spring closed grounding switches are installed in the main tank of the distribution transformers, which short circuit and ground the high-voltage terminals of the transformer. An interlock coil is provided on these distribution transformer grounding switches to minimize the danger of closing the switch while the transformer is energized. In case the interlock should fail the switch, being spring closed, closes rapidly, and it is rated for the maximum obtainable ground current.

A test was made on a 13,800-volt network feeder on the system to determine the maximum voltage obtained under the condition of an accidental back feed on a feeder grounded (three phase) at only one location. The distance from the point of grounding to point of back feed was 16,000 ft. The transformer capacity at point of back feed was 150 kva., connected delta-wye. The voltage obtained on the 13,800-volt side of the distribution transformer at the point of back feed was from 75 to 82 volts (r.m.s.) per phase, which checks with calculated values for such conditions.

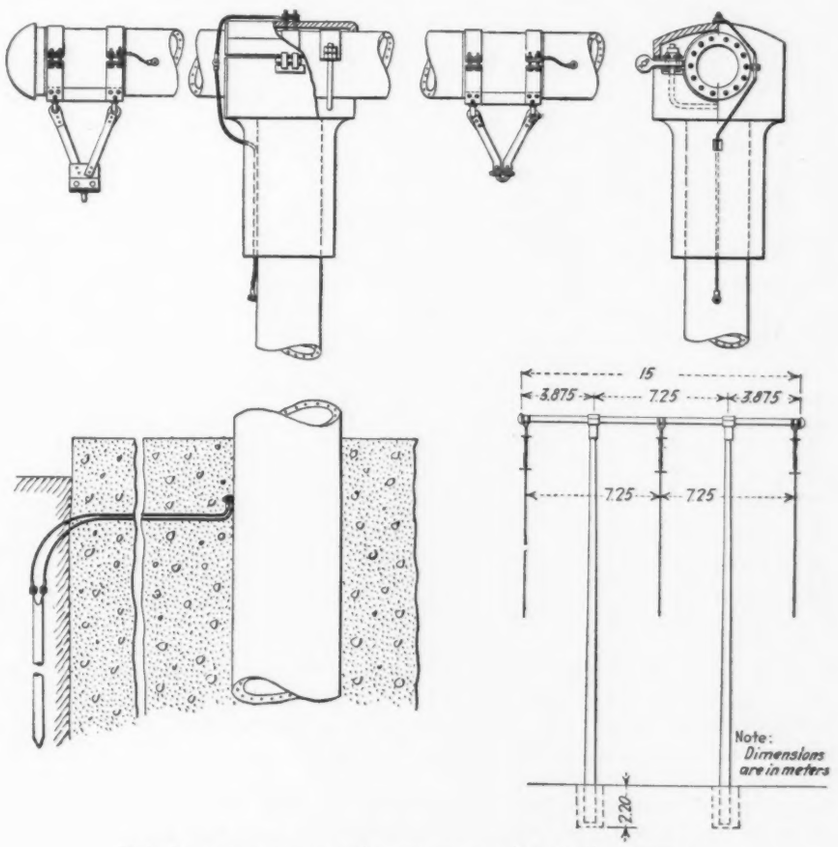
The test showed that it is absolutely safe for a man to work on a 13,800-volt feeder with protective grounds applied in so far as back feed from the network is concerned.

Centrifuged Reinforced Concrete Supports for 220-Kv. Italian Line

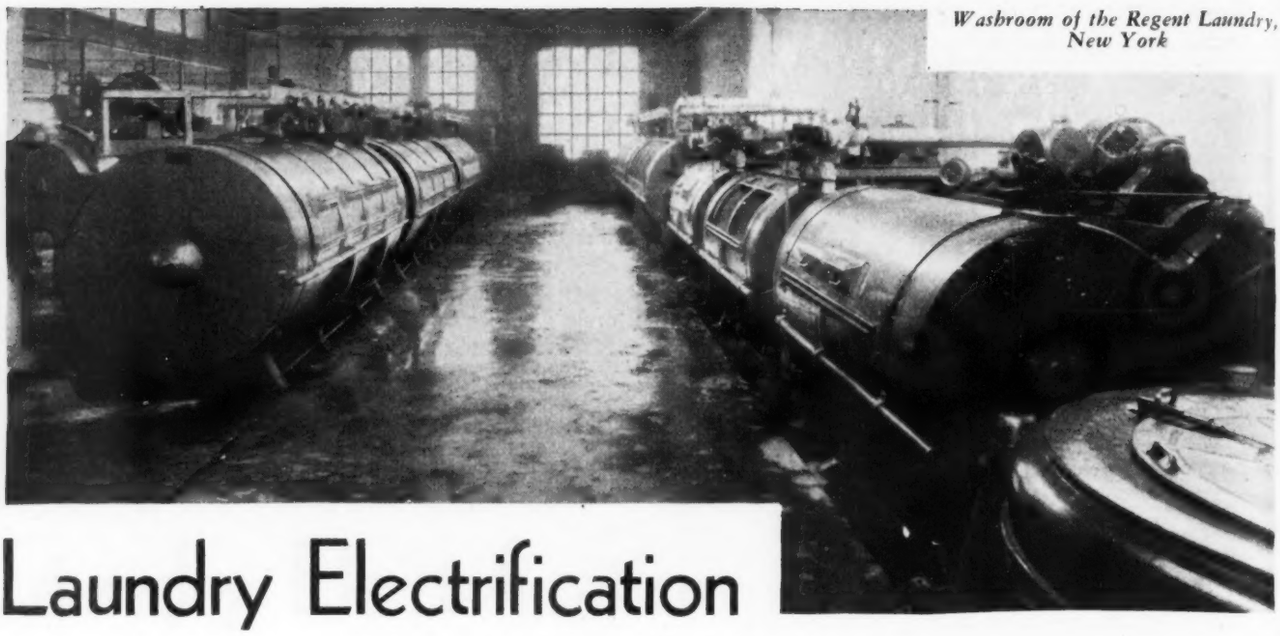
Transmission line supports which are unusual to the United States are used on the 220-kv. Cardano-Cislago line terminating about 20 km. north of Milan, Italy. They are characterized as centrifuged reinforced concrete gantries by A. Dalla Verde, central director of the Societa Idroelettrica Piemonte, Turin, and are here illustrated. Two hundred and forty-eight of these structures are used in the level section and 42 double gantries (double-legged with three struts about equally spaced) for anchor towers. Steel towers, not much different from those in this country, are used elsewhere.

The circuits are rated at 150,000 kw. each and along level sections are composed of aluminum-silicon-magnesium and iron-alloy conductors. These are supported about 19 m. above ground and 7.25 m. apart in a horizontal plane. The spans are 240-260 m. on the section employing the centrifuged supports.

Except for the details shown and presented at the International Conference in Paris, no further information has been made available on the structures, but results of tests were reported by Mr. Dalla Verde. Tests simulating zero-degree temperature with snow and without wind, same conditions but with one broken conductor at extremity of crossarm, zero-degree temperature with wind perpendicular to line without snow and erection stresses, were conducted with satisfactory results.



Reinforced concrete tube structures for Italian 220 kv.



Washroom of the Regent Laundry, New York

Laundry Electrification

The control problems include starting torque, rapid acceleration, frequent reversals, spotting, safety and low current inrushes.

New developments in equipment and control.

By R. S. ELBERTY, Jr.
Laundry Electrical Engineer
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

AT THE present time the nation's laundry bill runs over ten million dollars weekly and the industry doubles approximately every eight years. The growth of the laundry industry has been made possible by the development of special, high capacity laundry machinery, most of which is electrically driven.

In order to handle laundry work in large quantities electrical equipment must be designed to match the requirements of the machine. The engineer of the average power laundry has not had extensive experience with electrical apparatus and it is imperative that the electrical apparatus on laundry machinery be made as nearly self-sustaining as possible.

Motor and control apparatus for laundry machines will have special characteristics according to the function of the machine, and a descripition of laundry control apparatus might well be divided into classifications according to the machinery used.

Laundry work is washed in a perforated cylinder revolving in a tub or container for the suds solution or rinse water. The revolving cylinder must be reversed periodically in order to prevent twisting or entangling of the material being washed. In addition to the reversing action, washers are equipped with "inching" or "spotting" devices to enable the operator to register the cylinder door with the tub door for loading and unloading the machine. On some machines an automatic unloading feature is used. The special requirements of laundry washers may be summed up as follows: Machines must reverse from two to four times per minute, safety interlocks are necessary to guard the operator and automatic or semi-automatic spotting features are used. Ratings up to 15 hp. are necessary.

At one time a motor-driven drum was used to control the reversing of laundry washers. However, with the development of larger, high capacity washers and the application of large motors, these slow-moving drum controllers were not satisfactory. At the present time contactor panels or special reversing switches are used for this purpose. Such a controller must operate from 200,000 to 500,000 times per year and the usual commercial control apparatus is not made sufficiently rugged to withstand this heavy duty.

The spotting features of laundry washers are greatly simplified by the use of a magnetic brake on the motor shaft, although mechanical brakes are still used on some machines. With a magnetic brake, the machine is controlled from a push-button station. Machine limit switches are used as door interlocks so that the machine cannot be operated with the door open except for inching. The latest type of push-button-operated washer controllers requires that the operator use two hands for inching the machine.

Alternating-current motors are usually reversed directly across the line, a refinement made possible by the development of the reactance or "cushioned reversal" type of induction motor. The torque characteristics of this motor match the machine requirements and a smooth

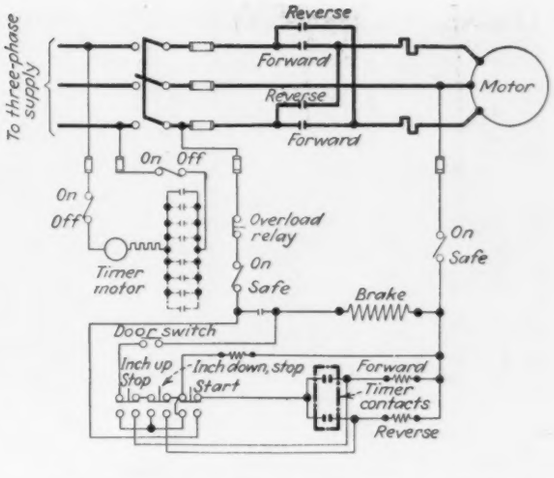
reversal is accomplished without the use of complex control apparatus. Direct-current motors are usually reversed with a lockout contactor to prevent plugging and two steps of time limit acceleration, although current limit acceleration has been used. The recent development of inductive time-limit contactors for this application has simplified the d.c. controller to such an extent that d.c. washer controllers can be made the same size as the equivalent a.c. controller.

The laundry drying tumbler uses the same type of reversing controller as the washer and an additional fan controller. Reversing controllers are used for ratings up to 5 hp. and fan controllers are used up to 15 hp. Magnetic brakes, door switches and push-button stations are used as accessories in much the same way as they are used on washers.

The laundry extractor removes surplus water from freshly washed clothes by means of centrifugal force. The heavy inertia of the revolving mass and the necessity of starting with a low current consumption generally imposes the requirement of long accelerating time. Alternating-current motors are usually thrown directly across the line. Direct-control apparatus must have a high thermal capacity to take care of accelerating times running as long as three or four minutes.

One of the main difficulties encountered in an extractor controller was the necessity of guarding against too frequent starting of the machine. The ordinary thermal overload relay cannot be used for this purpose because of the long time required for acceleration. In order to compensate for this long time the mass of the heating element must be increased to add a time lag to the action of the relay. A satisfactory thermal overload relay uses a heavy bimetal strip and will allow operation normally at six starts per hour, but will shut down the extractor if it is operated at eight starts per hour for more than 30 minutes.

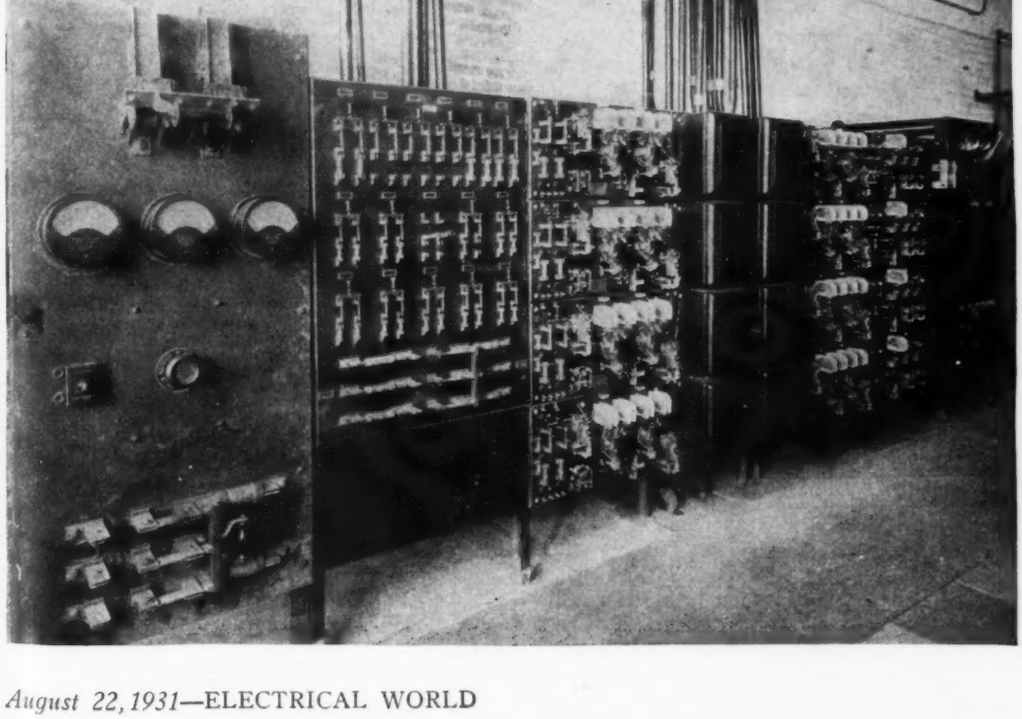
Direct-current controllers use current-limit or counter-emf. acceleration The current limit is preferable on the large machines because wide voltage fluctuations are sometimes encountered in laundries. The time of extraction is usually determined by a clock or motor-driven timer. Mechanical brakes released by magnetic latches are used for stopping the machines, and in some cases reverse phase or dynamic braking is used. Switches are used as cover interlocks and centrifugal switches are sometimes mounted on the motor shaft to control magnetic cover latches.



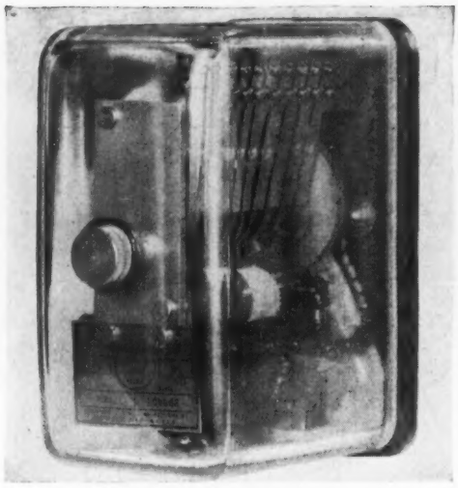
Schematic diagram of washer a.c. control with magnetic brake

The laundry flatwork ironer must be capable of ironing different classes of materials ranging from sheets to heavy bedspreads. Not all materials can be ironed at the same speeds and adjustable-speed electrical equipment is usually furnished. The horsepower input to an ironer will vary directly as the speed and the constant-torque motor and control apparatus is used.

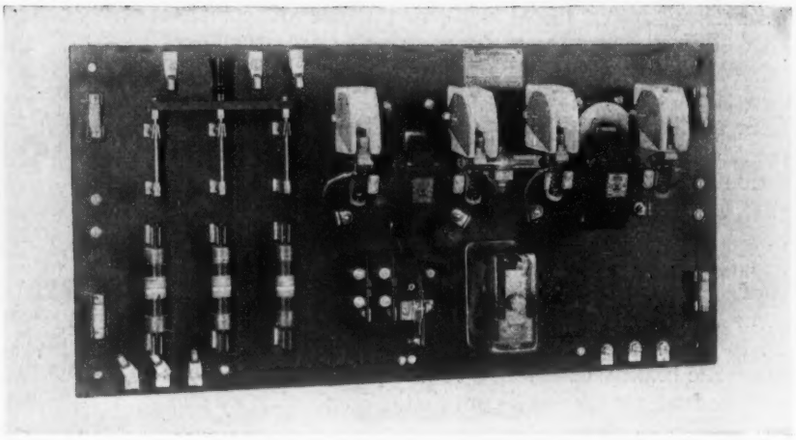
Smaller machines using motors rated 3 hp. and under are equipped with variable speed armature control on d.c. machines and wound rotor control on a.c. machines with a speed range of 2:1. However, the power losses in the controllers become of economic importance where motors larger than 3 hp. are used, and the large ironers



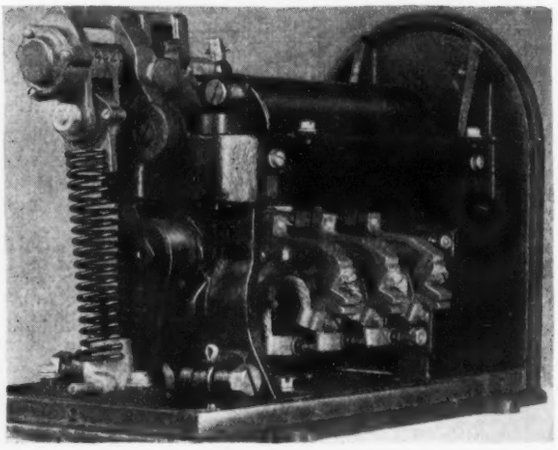
A laundry panelboard installation



Timing relay provides for reversing eight washers successfully

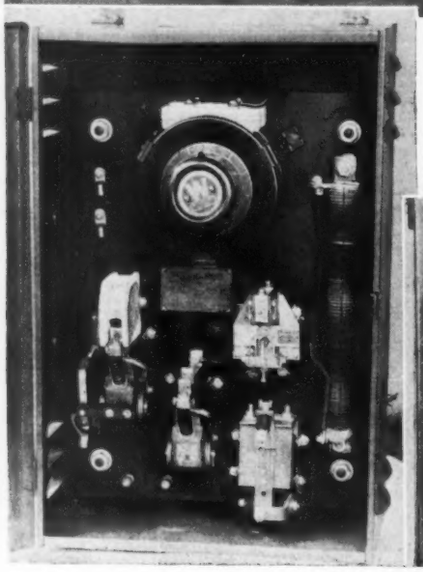


A three-phase washer controller



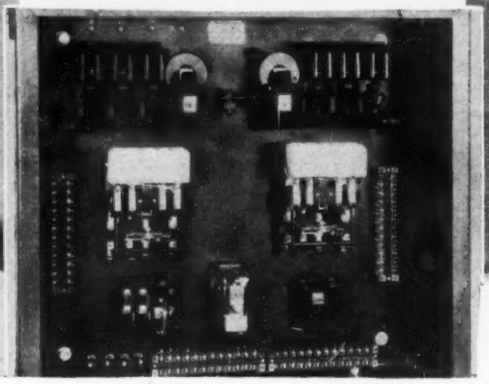
Special reversing switch for washers must operate from 200,000 to 500,000 times per year

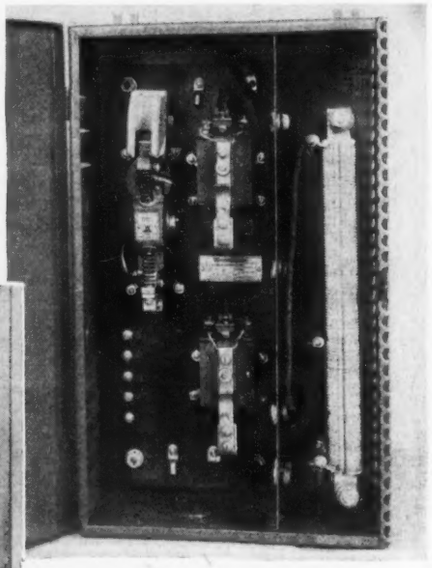
Centrifugal extractor for removing surplus water from clothes



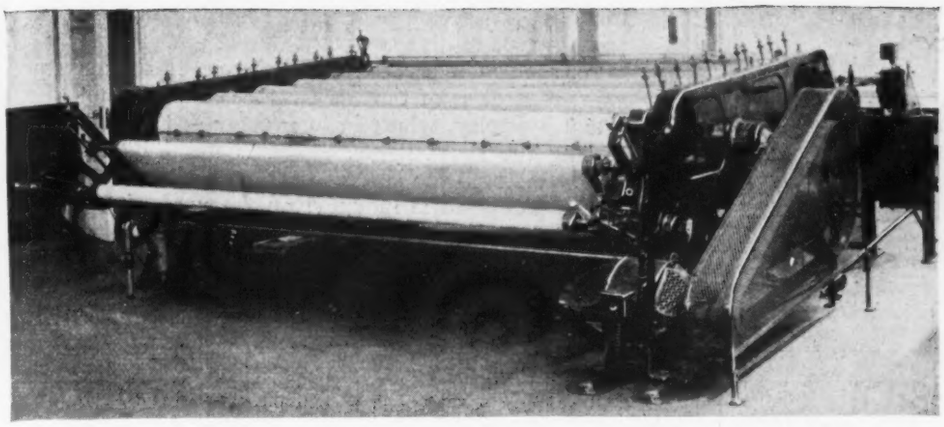
D.C. ironer control for large machines

Two-phase combined controller for dry cleaning machine





Direct-current washer controller for use with reversing switch



An ironer installation for a hospital

use field control on d.c. machines and multi-speed motors on a.c. machines. Push-button control is used and a finger-guard-operated limit switch is sometimes used as a safety requirement. Some machines use a motor-mounted magnetic brake to prevent the machine from coasting when the finger-guard has been tripped in an emergency.

Unlike the other laundry controllers, flatwork ironer control apparatus is usually mounted adjacent to the machine. It is, therefore, advantageous to furnish the control apparatus in a unit form. Magnetic starters are mounted in back of the pole-changing drums or wound-rotor faceplate controllers. Direct-current controllers are made in a unit form. A new development in the d.c. ironer controller employs inductive time limit acceleration to full field and a field fluttering relay to bring the motor to top speed.

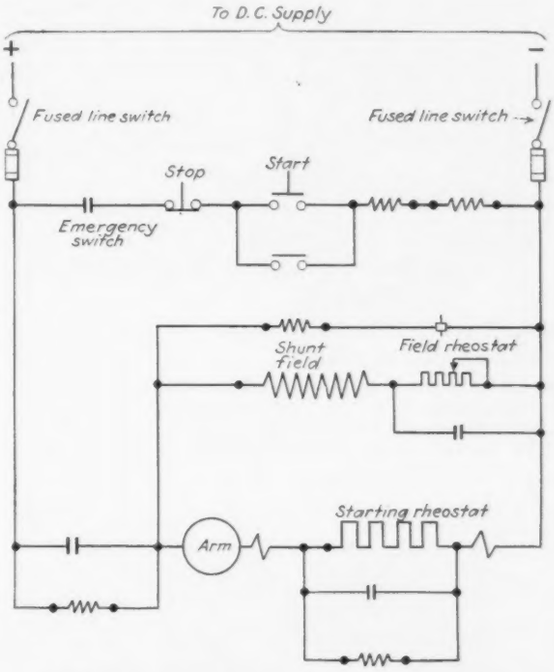
Combined control equipment located in engine room

Many laundry owners prefer to have most of their electrical control equipment located in the laundry engine room. The cost of wiring between the control board and the various machines must be considered, but the central location of control offers advantages in ease of maintenance and the electrical interlocking of machines.

In order to reduce the maximum demand charges laundry washer controllers are often interlocked so that no two washers can reverse at the same time. In like manner, it is sometimes advantageous to interlock extractor controllers to prevent accumulative current peaks. A centralized control board will enable the electrical and mechanical interlocking of controllers and will often pay for itself in reduced maximum demand power charges.

Some laundry and dry cleaning machines require more than one motor. Blanket-finishing machines use a brush and a fan motor and drying tumblers use cylinder and fan motors. With this type of machinery special combined controllers are often used to simplify the wiring of the machine. These combined controllers differ from the panelboard control in that the equipment is inclosed in a cabinet and is usually furnished as a part of the machine. In order to operate the machine it is only necessary to connect the source of electrical energy to the controller.

Laundry motor and control apparatus is designed to have a life equivalent to the life of the machine. Some special apparatus has been designed for unusual conditions. A number of special reversing single-phase washer motor and control units have been furnished for use in laundries on government Indian reservations. Explosion-tested motor and control apparatus is used in dry-cleaning plants using inflammable solvents. Special voltage ratings are sometimes required. About 25 per cent of the electrical equipment sold to machinery manufacturers in the laundry industry is direct current. Alternating-current equipments are usually three phase, 60 cycles, but two-phase equipment is used in the Philadelphia district. Requirements sometimes call for 25-, 40- and 50-cycle equipments.



Schematic diagram for d.c. ironer controller

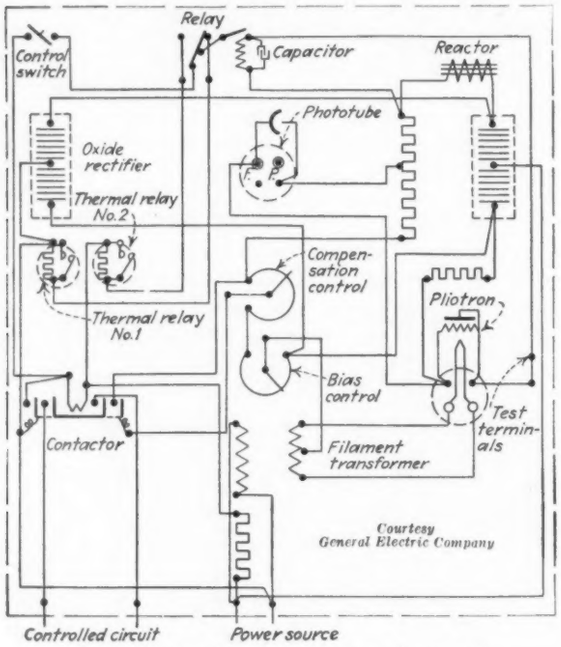
One problem faced by the machinery manufacturers has been the use of power network systems, a number of which have load voltages as low as 199. Rather than furnish motor and brake torques in excess of the requirements of the machines, so that satisfactory operation can be obtained at 200 volts, the usual procedure is to furnish special 200- or 208-volt equipments for this class of service.

Photo-Cells Control North Albany Street Lights

Photo-cell control has been applied to nine street-lighting circuits in North Albany, N. Y., and it has been reported by the New York Power & Light Corporation that all of the 75 circuits in Albany will be operated in a similar manner ultimately. Plans are also under way to apply the system in Schenectady, Troy and other districts served by this company.

As soon as a predetermined degree of darkness prevails, regardless of time of day or season, the photo-cell actuates a relay, which in turn operates the switch controlling the street lights. When natural light is sufficiently restored the reverse operation occurs.

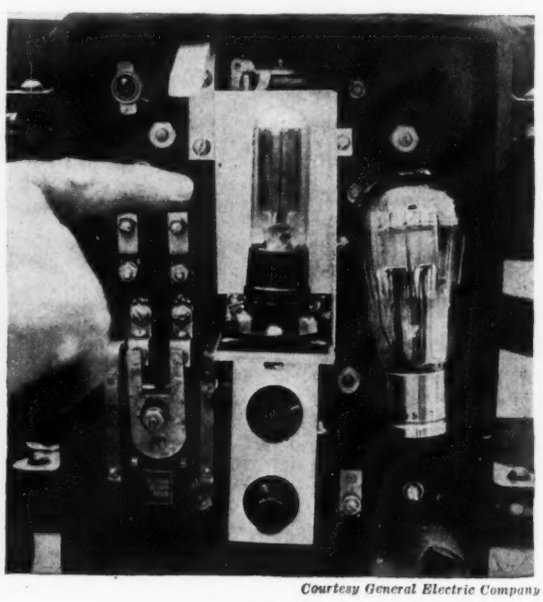
The photo-cell is mounted on the roof of a building and the eye is directed toward the north, so it will receive average light and not direct sunlight. A thermal time-delay relay prevents instantaneous operation or fluttering of the street-lighting control in response to disturbances such as the passage of a cloud over the sun, a flash of lightning at night, a person walking in front of the unit, etc.



Control circuit actuated by photo-cell

Photo-cell control for street lights mounted on roof of building

In the general view, D. G. Whitecotton, Capitol division engineer, is pointing to the "eye" directed at north sky. The interior view shows the photo-cell in the center, the amplifier tube at the right and the contactor at the left.



Courtesy General Electric Company

READERS' FORUM

Is Ultraviolet Better Lighting?

To the Editor of the ELECTRICAL WORLD:

I was very much interested in your recent editorial on "Ultraviolet" and the two letters of criticism on same in the August 1 issue. I don't quite get the idea of the two letters. They say exactly the same thing that you say in your editorial. The only definite statement I can find in the letters is the one that ultraviolet is good for rickets. Outside of that both letters contain a great deal of information, but not a single definite statement as to what else ultraviolet is good for. They talk about better lighting. Of course, everybody wants better lighting. But is ultraviolet better lighting? And in what respect is it better? Let us forget generalities and have some definite facts. Generalities are not engineering; facts are.

M. M. SAMUELS.

New York, N. Y.

Men of the Industry

C. E. Dove Assumes New Executive Duties

CHARLES E. DOVE has recently been named vice-president and general manager of the Central States Power & Light Corporation, with headquarters at Dubuque, Iowa. Mr. Dove has been prominently identified with the Utilities Power & Light Corporation, Chicago, Ill., since 1913 in various managerial capacities. He has already joined the Central States Corporation, an associate company of the Interstate

Power Company, Dubuque, Iowa, both subsidiaries of the Utilities Power & Light Corporation. Mr. Dove is not a newcomer to Dubuque. He returns to that city after eight months spent in Newport, R. I., as vice-president and general manager of the Newport Electric Corporation. He went there from Dubuque in 1930 from the position of assistant general manager of the Interstate Power Company.

At the time Mr. Dove joined the Utilities Power & Light Corporation in 1913 to take over the management of a division of the Indiana Power Company at Vincennes, he relinquished a managerial post with the municipal properties of Washington, Ind., a position which he held for a number of years. He went to Dubuque in 1924 to become manager of the Dubuque Electric Company and the Iowa Electric Company. Taking over the Dubuque units by the Interstate Power Company created a new office for Mr. Dove, that of manager of the southern Iowa division of the corporation. Consolidation of the divisions and expansion gave him a new office in 1929 and 1930, assistant general manager, which he held until he was transferred to Newport, R. I. Mr. Dove is a native of Indiana.

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DR. RALPH D. BENNETT has been appointed associate professor of electrical engineering at the Massachusetts Institute of Technology. Dr. Bennett has an unusually wide experience in theoretical and practical electricity. He was associated with Professor Arthur Compton in some important experiments, held a native research fellowship in physics at Princeton and later at the California Institute of Technology. During the last year he has been assisting Professor Compton in preparing for a series of experiments on cosmic rays.

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WARREN VIESSMAN, who was appointed engineer in charge of the Bureau of Mechanical-Electrical Service, Baltimore, in 1927, has resigned from that position to engage in private practice. Before becoming associated with the city, Mr. Viessman was with the Consolidated Gas, Electric Light & Power Company. LEON SMALL, who was chief of the bureau's engineering division and formerly with the Bureau of Water Supply, has been placed in charge of the Bureau of Mechanical-Electrical Service by Mayor Howard W. Jackson.

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H. H. SCHOOLFIELD has been appointed chief engineer of the engineering departments of the Pacific Power & Light Company and Northwestern Electric Company, Portland. These departments have recently been consolidated. The two companies are operating properties of the American Power & Light Company and have had consolidated accounting and legal departments for some years. Mr. Schoolfield, who has been in the engineering department of the Pacific Power & Light Company since 1911, was made assistant chief engineer of that company in 1915 and chief engineer in 1917. He has been active in electrical engineering circles in the Northwest, having held many important positions in the American Institute of Electrical Engineers and the engineering section of the Northwest Electric Light and Power Association. E. F. PEARSON, who became chief engineer of the Northwestern Electric Company a year ago, will function in much the same capacity as formerly with the title of assistant chief engineer in the newly consolidated departments.

W. F. Raber Heads San Diego Utility

W. F. RABER, who was recently elected president of the San Diego Consolidated Gas & Electric Company, as announced in the August 1 issue of the ELECTRICAL WORLD, began his career with the Central Union Telephone Company of Ohio in 1891. In 1892 he became superintendent of the lighting department of the Citizens Electric Railway, Light & Power Company in Mansfield, Ohio, and in 1903 was made

general manager of the Mansfield Railway, Light & Power Company. He left this position two years later to become general manager of the Enid Electric Light & Power Company in Enid, Okla. From 1906 to 1911 he was general manager of the Ottumwa Railway, Light & Power Company in Ottumwa, Iowa. In 1911 he was named vice-president and general manager of the Arkansas Valley Railway, Light & Power Company, now the Southern Colorado Power Company, in Pueblo, Colo., which position he held until 1924, when he was elected vice-president and general manager of the San Diego company.

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GEORGE H. SHAW, general counsel of the Public Service Company of Colorado, has been appointed general counsel of the Cities Service Company and the Henry L. Doherty interests in Kansas, Missouri and Oklahoma with offices in Denver, Colo., and Topeka, Kan. Mr. Shaw will continue his work with the Public Service Company.

W. S. Van Sickel has been elected vice-president and general manager of the Mississippi Valley Power Company and president of the Fort Smith Traction Company to succeed Robert C. Coffy, who has assumed new duties in Muskogee. Mr. Van Sickel has been associated with the Byllesby organization since 1907, and until recently served as assistant general manager in charge of operation of the Fort Smith Traction Company and the Mississippi Valley Power Company.

Frank J. Moylan, who started his career with the Nebraska Power Company in 1911 as an office boy, was recently appointed secretary and treasurer of the company. From this humble beginning Mr. Moylan advanced consistently in the ranks and in 1921 he was appointed assistant secretary and treasurer, the position he held until his recent promotion. He is active in the affairs of the N.E.L.A., at the present time being vice-chairman of the customers' accounting division.

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OBITUARY

William S. Holman, 87, for many years president of the Athens Railway & Electric Company, Athens, Ga., died at his home in that city August 6. Mr. Holman when at the height of his career some years ago was one of the leading industrialists of the state. He was one of the founders of the Athens utility, which in recent years has been taken over by the Georgia Power Company.

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William H. Brimberry, 35, vice-president and part owner of the Capital Electric Company, Atlanta, and W. E. Keith, 32, district manager of the Grigsby-Grunow Company, with headquarters in Atlanta, were instantly killed in an airplane crash at Cincinnati August 9. Mr. Brimberry and Mr. Keith were passengers of the American Airways, returning from a radio distributors' meeting in Chicago, at the time of the accident. Mr. Brimberry had been prominent in electrical circles in Atlanta since his graduation from the Georgia School of Technology in 1916.

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Uzal H. McCarter, president of the Fidelity Union Trust Company of Newark, N. J., and a director of several other corporations, died August 15, of pneumonia, at his estate in Red Bank. Mr. McCarter was 70 years of age. The name of McCarter has been a prominent one for many years not only locally in Newark but throughout the State of New Jersey. His father was a trustee of Princeton University and a prominent corporation lawyer of Newark, and his two brothers, Thomas N. and Robert H., are outstanding figures, the former being president of the Public Service Corporation of New Jersey and the latter a former State Attorney-General. Uzal was born in Newton, N. J., and was graduated from Princeton University. At the time of his death he was a director of the Public Service Corporation of New Jersey, the Western Electric Company, the Newark Trust Company of Newton and two affiliated companies of his bank, the Fidelity Union Stock & Bond Company and the Fidelity Union Title & Mortgage Guaranty Company. He was chairman of the last named.

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J. Everette Brown, supervisor of appliance sales of the Philadelphia Electric Company, died suddenly, July 15, following an operation for appendicitis. He was 43 years of age. Mr. Brown, who was born in Ashland, Kan., entered the employ of the United Gas Improvement Company with the Northern Indiana Gas & Electric Company at Lafayette, and later he removed to Ardmore, Pa., as commercial agent for the Counties Gas & Electric Company. He remained in that position for six years, in 1928 being assigned to the position he held at the time of his death.

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Otis L. Williams, who some few years ago was connected with the Westinghouse Machine Company and with Westinghouse, Church, Kerr & Company, died August 14 at his home in Staten Island after a long illness. He was 66 years of age. Mr. Williams was born in Ithaca and was graduated from Cornell University. After severing his connections with the Westinghouse interests he became a member of the Stock Exchange firm of Brown, Williams & Burbank. Mr. Williams was a member of the American Society of Mechanical Engineers.

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William E. Richards, superintendent of electric distribution Toledo Edison Company, Toledo, Ohio, died suddenly, in his office in the Edison Building, August 12. A native of Waynesburgh, Ohio, Mr. Richards removed to Toledo, Ohio, in 1891, where he was responsible for the electrical and mechanical operation of the Consolidated Street Railway Company, and continued in the various organizations which followed the original company until his death. He had previously been connected with the Thomson-Houston Electric Company at Newton, Iowa. He pioneered many advances that have taken place on the Toledo Edison System, among them being the 23,000-volt underground cables and the 66-kv. transmission lines. Mr. Richards planned and installed the floodlighting system on the Statue of Liberty on Bedloes Island, for which the city of New York presented to him a gold medal, which was among his most cherished possessions. He was a member of several electrical societies, among them the Illuminating Engineering Society, Edison Association, American Institute of Electrical Engineers and National Electric Light Association.

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Lewis J. Wells, manager of the theatrical installation division of the Diamond Electric Manufacturing Company, Los Angeles, was killed in an airplane accident in Los Angeles, July 16. Mr. Wells was graduated from the California Institute of Technology in 1922 and entered the employ of the Diamond Electric Manufacturing Company that same year. He was a member of the American Institute of Electrical Engineers.

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Samuel C. Morehouse, well-known corporation lawyer and a member of the firm of Alling, Webb & Morehouse, New Haven, Conn., died, of heart disease, at his summer home in Fairfield August 13, in his sixty-sixth year. Mr. Morehouse was graduated from the Yale Law School in 1885, returning the next year for a post-graduate degree. Following graduation he became affiliated with the firm with which he was associated until his death. Mr. Morehouse had made an intensive study of the public utility field and in the course of the past 25 years he had frequently acted in the capacity of consultant for such organizations. He established a brilliant reputation for the success with which he pleaded the public utility cause before the Legislature.

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Howard L. Browning, who was connected with the electrical industry in its early days, died at his home in Pittsburgh August 11, after a long illness. Shortly after graduation from the University of Pennsylvania Law School he became associated with the Edison Manufacturing Company and was made New York agent. Later he undertook some work in London and Pekin for the Edison Company, but in the late '90s he severed his connection with that organization to remove to Milwaukee, where he formed the Browning Electric Manufacturing Company. After selling his interest in that enterprise he joined the General Electric Company at Fort Wayne, Ind. Subsequently Mr. Browning was active as a stock broker and real estate operator.

Financial and Statistical News

PUBLIC utility bonds show advancing prestige in several directions. They have led additions to the savings bank legal lists, have been among the leaders in general institutional investors' lists and have been, along with municipals, the strong feature of the current bond market, even if a great proportion are still selling below par.

——GROSS REVENUE OF THE ELECTRICAL INDUSTRY CONTINUES ABOVE 1929 figures and only fractionally under those of 1930. Energy figures also are close to 1930 totals.

——SIX HUNDRED MILLIONS WILL BE SPENT BY UTILITIES for new construction this year, Managing Director Clapp of N.E.L.A. advises President Hoover informally.

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Advises Bondholders Bonds Above Call Price

ALTHOUGH IT IS UNUSUAL for a corporation to announce that its securities are selling at unduly high levels, Consolidated Gas, Electric Light & Power Company of Baltimore did virtually that last week in respect to a specific issue. The situation is one which might face any utility with bond issues subject to call.

A statement was issued by the Baltimore utility calling attention to the fact that its 5½ per cent series E bonds are now selling at around 108 despite the fact they may be redeemed at 105 after September, 1932. The statement includes the following:

"Investors have doubtless failed to realize that the series E 5½ per cent bonds of Consolidated Gas, Electric Light & Power Company of Baltimore, which have been selling at 107½ to 108, and are now callable at 107½, may be redeemed by the company at 105 after September 1, 1932.

"The company recently redeemed its series F 5 per cent bonds at 105 through the issuance of a new 4 per cent series.

"It is the belief that the series E 5½s were not redeemed at the same time because of the advantage to the company in awaiting the lower redemption price one year hence. Purchasers of the 5½s at the present market level would be subjected to a substantial decrease in the principal value of the bonds if they should be called at 105 next year."

It is obvious that the refunding of this issue, which amounts to $4,600,500, at somewhere around 4 per cent would effect quite a substantial saving. The company's 4 per cent first refunding mortgage bonds were sold recently at 95½ to yield about 4.21 per cent. A saving of even 1 per cent would lower annual fixed charges by $46,000 on this one issue, and the advantage to the company of waiting a year, when the callable price is 105, is obvious. The issue is callable at 107½ up to September, 1932; at 105 from then until 1942, and 102½ up to 1952. It would appear to be worth over $115,000 to the company to wait a year for redemption. What the cost of money will be at that time, of course, is any one's guess.

Since many utilities are taking advantage of a relatively firm utility bond market and low refunding rates to redeem their high interest bearing obligations, prices are usually being adjusted accordingly. Issues likely to be called generally reflect this by remaining close to the call price. This results in switching, in many cases, to non-callable issues, or at any rate to issues not subject to call in the near future.

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New Tenney Officers Are Elected

IN CONNECTION WITH the recent transfer of control of Charles H. Tenney & Company, Boston, to the New England Power Association interests as a part of the plan involving the acquisition of the North Boston Lighting Properties by the Massachusetts Power & Light Associates the following officers have been elected for the Tenney company: Chairman, Col. Charles H. Tenney; president, Frank D. Comerford; vice-presidents, Albert B. Tenney, D. Edgar Manson, Frank L. Ball, E. A. Bradley, I. S. Hall, F. C. Sargent, G. A. Rust; treasurer, Carl S. Herrmann; secretary, R. W. Pattée, and clerk, Donald Knowlton. The new board of directors comprises the following: C. H. Tenney, F. D. Comerford, J. H. Leman, B. Loring Young, R. S. Weeks, C. S. Herrmann and Harry Hanson.

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Utility Bonds Lead Legal List Additions

PUBLIC utility bonds continue to gain prestige both with the public and with institutional investors. This is reflected in numerous additions to the legal list for savings bank investment and also in a steady rise in market prices.

A recent analysis of the legal list by the New York State Banking Department shows that during the first seven months this year there was a net decrease of 22 issues in number of railroad bonds on the legal list for New York State and a net increase for public utilities of fourteen issues called for redemption during the period.

Investment in these issues by insurance companies also shows a rapid growth. A survey recently made by Wood, Struthers & Company shows that holdings of utility bonds by the major life insurance companies in the United States increased $1,300,000,000, or 426 per cent, in the last 7½ years. Their holdings of railroad bonds increased by $868,000,000, or 48 per cent, in the same period.

This investment popularity and the sustained earning power have resulted in a steady increase in the average price of power and light bonds since the first of the year. The group has advanced more, in fact, than any other. The Dow Jones index of ten utility bonds showed a gain of 8.14 points this year to July 31. The Standard Statistics index of fifteen utility bonds showed an average yield last December of 4.61 per cent. This has decreased steadily month by month to 4.40 in July as prices increased.

Of course this price advance has been limited and several issues are still well below par. It must not be overlooked that while power and light companies have held up their earnings creditably through the depression, they have certainly not escaped entirely. Sales of power for industrial use have been restricted by depressed business. But in comparison with other groups the utility bonds have held their own in a creditable way.

Houston Lighting Buys Galveston Properties

NEGOTIATIONS HAVE BEEN completed for the acquisition by the Houston Lighting & Power Company of all of the electric power and light generating and distributing properties previously owned by the Galveston Electric Company in the city of Galveston and all the electric power and light properties of the Galveston-Houston Electric Railway Company, including the electric generating station at Webster and two transmission lines extending from Webster to Galveston, a distance of approximately 25 miles. No street or interurban railway lines are included in the properties purchased.

The operation of the new properties will be taken over immediately by the Houston Lighting & Power Company, which will operate them as an integral part of its own system. A physical interconnection between the properties already existed, as the Houston Lighting & Power Company has been supplying at wholesale the power requirements of the properties. The city officials of the city of Galveston, as already recorded in the ELECTRICAL WORLD, recently passed ordinances giving the assent of the city to the sale of the electric properties in Galveston to the Houston Lighting & Power Company and granting a new 50-year franchise for the operation of the properties by that company.

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NEWS BRIEFS

Directors of the Central Public Service Corporation have declared a quarterly dividend of 1¼ per cent in class A stock on the class A stock, payable September 15 to holders of record August 26. This places the stock on a 5 per cent annual basis, against 10 per cent previously.

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There have been called for payment September 1 first and refunding mortgage gold bonds, series due 1954, of the Luzerne County Gas & Electric Company, amounting to $25,000, at 107½ and interest.

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Virginia Electric & Power Company has made an offering of $6 dividend preferred stock to its employees on the partial-payment plan at $100 a share, plus accrued dividend.

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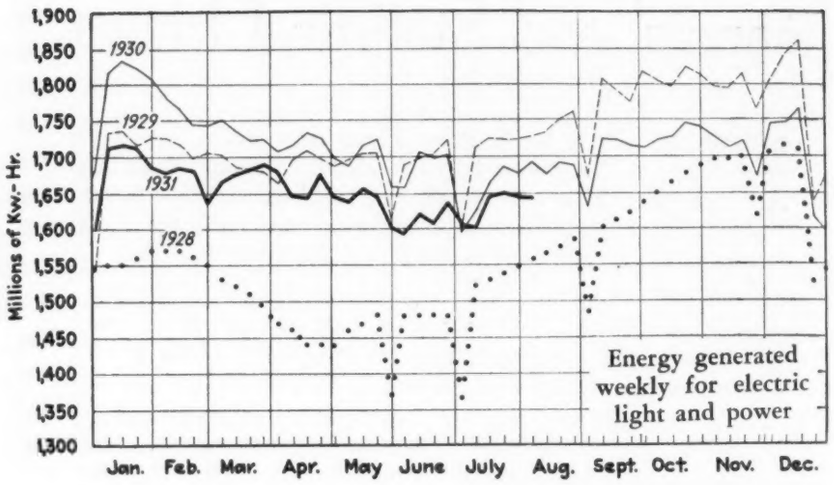
Southern Indiana Gas & Electric Company, a subsidiary of the Commonwealth & Southern Corporation, has called for redemption at 104 and interest October 1 its first lien and refunding mortgage gold bonds, series B (6 per cent due 1947), which are outstanding in the amount of $1,276,700.



Weekly Energy Output

COMPARED WITH THE corresponding week last year, central-station energy output during the week ended August 15 decreased 2.9 per cent.

Estimated output during recent weeks, with equivalent figures for earlier years, as announced by the statistical research department of the National Electric Light Association, was as follows:

	1931	1930	1929	1928
July 18.....	1,645	1,667	1,727	1,530
July 25.....	1,651	1,686	1,723	1,539
August 1.....	1,644	1,678	1,725	1,549
August 8.....	1,643	1,692	1,730	1,558
August 15.....	1,629	1,678	1,753	1,558

The above table gives the revised figures for the month of July and the chart has been redrawn so as to incorporate those and other revisions as explained in the ELECTRICAL WORLD of August 15.

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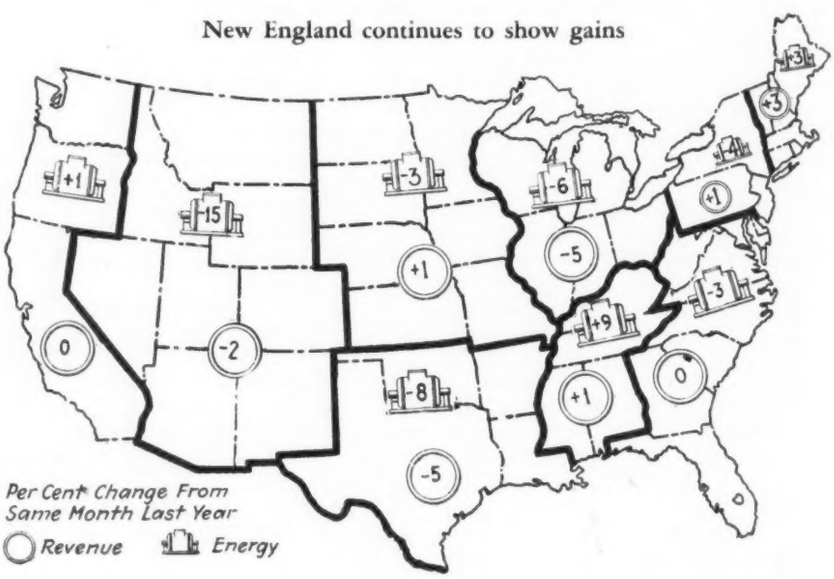
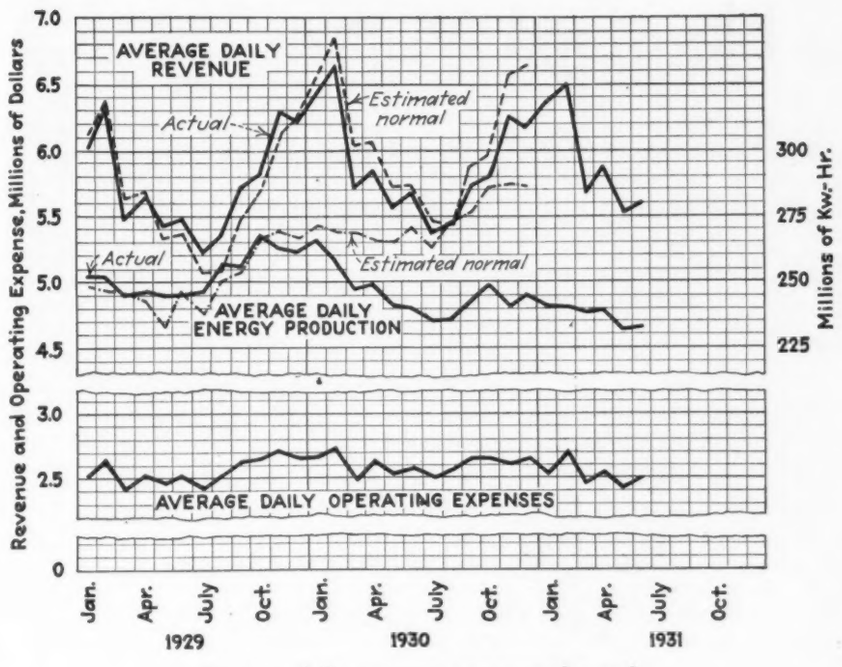
Revenue Under 1930 but Exceeds 1929

REVENUE of electric light and power companies continued slightly under the level of 1930 but above that of 1929, according to returns for June compiled by the ELECTRICAL WORLD. The total for the industry, allowing for missing reports, is estimated at $167,690,000, which is 0.9 per cent less than in the corresponding month of 1930, but 1.4 per cent more than in 1929. The average daily revenue was slightly greater than in May, though the monthly totals show a decrease of $3,860,000. Operating expenses dropped 2.0 per cent compared with last year, to $74,920,000, leaving the net virtually the same in both years.

Energy output, 7,004,600,000 kw.-hr., was less than in 1930 by 3.3 per cent; in May the difference was 4.7 per cent.

New England continues to show gains





Average daily revenue on upward trend

Table I—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1931	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
March	7,423,871	—3.4	2,488,399	—19.3	4,935,472	+7.3	1,933,000	+9.6
April	7,189,134	—4.5	2,947,019	— 4.8	4,242,115	—4.3	1,864,000	+9.0
May	7,191,204	—4.7	2,963,301	— 1.2	4,227,903	—7.0	1,862,000	+6.0
June	7,004,599	—3.3	2,639,273	— 5.4	4,365,326	—1.9	1,881,000	+5.0

Table II—Regional Operations Revenue and Energy Output in June, 1931

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	167,690	—0.9	7,004,599	— 3.3	2,639,273	— 5.4	4,365,326	— 1.9
New England	16,550	+2.5	458,601	+2.7	247,675	+25.0	210,926	—15.1
Middle Atlantic	42,740	+0.5	1,666,905	— 3.5	471,266	— 3.3	1,195,639	— 3.5
East North Central	40,200	—4.8	1,628,370	— 5.7	167,201	—13.1	1,461,169	— 4.8
West North Central	14,130	+1.1	448,889	— 3.2	112,051	—21.4	336,838	+ 4.7
South Atlantic	18,620	+0.4	810,516	— 3.4	446,476	+ 0.4	364,040	— 7.8
East South Central	5,760	+1.0	289,806	+ 9.1	239,186	+10.1	50,620	+ 4.5
West South Central	9,280	—5.0	402,495	— 7.9	5,435	+28.9	397,060	— 8.2
Mountain	4,160	—2.0	261,489	—14.5	226,697	—13.6	34,792	—20.4
Pacific	16,250	+0.1	1,037,528	+ 0.7	723,286	—14.1	314,242	+67.7

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

Table III—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1931 Thousands	1930 Thousands	Per Cent Inc.	1931 Thousands	1930 Thousands	Per Cent Inc.
March	$175,840	$176,400	—0.3	$76,520	$77,200	—0.9
April	176,210	176,110	+0.1	75,880	78,300	—3.1
May	171,550	172,900	—0.8	74,560	77,900	—4.3
June	167,690	169,200	—0.9	74,920	76,400	—2.0

Table IV—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month 1931	Coal		Oil		Gas	
	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
March	3,140,873	— 0.7	612,590	0	10,113,630	+8.4
April	2,713,378	— 9.3	530,986	— 9.8	9,607,900	+ 0.8
May	2,704,019	—11.0	533,406	— 9.9	9,879,827	+ 2.9
June	2,706,288	— 8.3	611,961	+ 0.3	11,604,154	+17.6

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by the U. S. Geological Survey.

Output from water power constituted 38 per cent of the total and was down 5.4 per cent, evidently as an after effect of the past two years' drought; it fell short of the May output by more than 10 per cent. Output from fuels fell only 1.9 per cent compared with June, 1930, and was slightly greater than in May. Increasing efficiency in the utilization of fuel is shown by the consumption of about 250,000 tons less of coal than last year, only partially balanced by the greater use of natural gas according to figures recently issued.

Regionally the persistently greater output and revenue in New England, over operations last year, has been a conspicuous feature for several months, Revenue is holding at least up to last year's figures along the Atlantic and Pacific coasts and in the Southeast; in the central industrial area and the Southwest returns of light and power companies as a whole still reflect an industrial situation decidedly less active than last year, although individual companies have done better. In this area, however, the output has come somewhat closer to that of last summer and the revenue may be expected to show a similar change in the following month.

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Canadian Output Smaller

MONTHLY FIGURES ISSUED by the Dominion Bureau of Statistics now indicate that the current year's production from central electric stations in Canada will be well below that in 1930, unless there is a marked pick-up in the last half of the year. During May the output of all central electric stations amounted to 1,359,805,000 kw-hr. This compared with 1,544,627,000 in the same month a year ago and is one of the lowest monthly figures recorded since 1928. Following this, June fell to 1,284,260,000 kw.-hr., against 1,434,611,000 kw.-hr. last year, the rate of decrease being 10.5 per cent. Cumulative figures for the first six months of this year make the total output 8,283,690,000 kw.-hr., which is 7.4 per cent less than the production figures for the corresponding period of last year.

Business News and Markets

Patent Rights on Electrolytic Cells

PATENT RIGHTS ON ELECTROLYTIC CELLS invented in 1922 and improved in subsequent years by Alexander T. Stuart of the Ministry of the Interior have been given to the Canadian General Electric Company. Stuart developed his apparatus while in the employ of the Dominion government, whose property the patent became. Now the Privy Council has given the Minister of the Interior authority to issue to the Canadian General Electric Company an exclusive license to make, use and sell in Canada, for use in the Dominion, oxygen-hydrogen generators covered by patents the property of the Crown.

The patents covered were originally taken out in 1922, 1924, 1927, 1930 and 1931, all in the name of Alexander T. Stuart. The company agrees that the apparatus used or sold in Canada shall be manufactured wholly in the Dominion with Canadian labor and, in so far as possible, out of Canadian materials. It is also provided that should the General Electric in the United States make further discoveries along these lines these will become available to the Canadian company. Royalties of 4 per cent per annum are to be paid to the Canadian government.

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Magnetic Properties of Commercial Steels

PREPARATION OF A SERIES of critical abstracts of the literature on magnetic analysis will be undertaken by the committee on magnetic analysis of the American Society for Testing Materials. This committee, the chairman of which is A. L. Sanford, chief of the magnetic section, National Bureau of Standards, will also shortly begin an experimental survey of the magnetic properties of several series of commercially important steels and will collect such data as can readily be obtained on magnetic test specimens. This information should serve as a valuable foundation for investigations in the field of magnetic analysis.

An important contribution to the knowledge of magnetic analysis was the paper "Relation Between Magnetic Properties, Impact Strength and Hardness" given by Haakon Styri, director of research S.K.F. Industries, Inc., Philadelphia, Pa., at the recent annual meeting of the A.S.T.M. in Chicago. This gave the results of a subcommittee's investigation of this relation. It was brought out that a number of magnetic methods of investigation gave direct correlation with hardness and impact strength and that the latter decreases with increase in hardness. Variation in tempering temperatures in the range investigated have much greater influence on hardness and impact values as well as magnetic properties than changes in quenching temperatures within the investigated ranges.

Osram Absorbs Vertex

ANNOUNCEMENT UNDER DATE of July 1, 1931, has been made jointly by Osramlampen and Vertex Elektrowerk, near Vienna, Austria, that the business of the two concerns has been combined and that operations of the latter are hereafter to be carried on under the name Osram Oesterreichische Glühlampenfabrik, G.m.b.H., using the methods and patents of the Osram Company.

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Factory Inspection Work on Armored Cable

THE following recent developments in the factory inspection work on armored cable as conducted by Underwriters' Laboratories, Inc., are announced:

With the advent of paper-wrapped armored cable and the necessity of using with it a bushing at each termination of the armor, difficulties were sometimes experienced in the field in properly installing the bushing. Accordingly, a part of the factory inspection work now consists of determining if the material is so constructed that bushings can be inserted as intended. When not so constructed, the material is not acceptable for labeling.

The fact that the armor of armored cable may be called upon to pass a ground current makes it most desirable that the ohmic resistance of the armor be, from a fire prevention viewpoint, sufficiently low to permit passage of enough current to open branch circuit fuses. A maximum ohmic resistance per 100 ft. has therefore been adopted for 14-2 material and it is probable that values will be adopted for other sizes in the future. The factory inspection work on all 14-2 material now includes an ohmic resistance test as a condition of labeling.

Capable of identification

It has always been a requirement that armored cable be capable of identification as to manufacture. The next edition of the National Electrical Code will require that this identification consist of a mark in the armor and this will, of course, automatically become a requirement of Underwriters' Laboratories when the new code is issued.

It has also long been a requirement that the material be tagged as to date of manufacture. It is now required that the date of manufacture be perforated in the labels attached to tags on the coils.

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Network Equipment for Brooklyn Edison

AN ORDER AMOUNTING to approximately $650,000, consisting of 124 low-voltage alternating-current network units of the latest type, has been placed by the Brooklyn Edison Company with the Westinghouse Electric & Manufacturing Company. The primary voltage will be 27 kv. stepped down to 125/216 volts.

Each unit consists of a 500-kva. transformer with a CM-2 network protector mounted on it and will be constructed so as to operate entirely submerged if the occasion demands.

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Timken Gets Large Bearings Order

AN ORDER HAS BEEN received by the Timken Roller Bearing Company, Canton, Ohio, for the bearings for 150 of the new electric locomotives to be built for the Pennsylvania Railroad for its electrification project between New York and Washington. It is stated to be by far the largest order for antifriction bearings ever placed by any railroad and includes tapered roller bearings for all of the engine trucks and the driver wheels. Ninety of these locomotives are for passenger service and 60 for freight service. The passenger locomotives are designed for a speed of 90 m.p.h.

The equipping of these locomotives

with Timken bearings is the result of long experiments involving a great deal of preliminary research work and the development of a particular type of Timken bearing and mounting especially suited to this work.

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Johns-Manville Sales Up for Quarter

NET PROFIT REPORTED by Johns-Manville Corporation for the second quarter was $715,657 after expenses, federal taxes, etc., against $230,109 in the preceding quarter and $998,529 in the June quarter of 1930. The consolidated income account for the second quarter this year and last and for the six-month periods follow:

	1931	1930
Sales	$9,618,774	$13,397,256
Cost and expenses	8,815,570	12,283,021
Balance	$803,204	$1,114,235
Federal tax	87,547	115,706
Net profit	$715,657	$998,529
Six months ended June 30:		
Sales	$17,430,261	$25,561,918
Costs and expenses	16,378,674	23,603,985
Balance	$1,051,587	$1,957,933
Federal taxes	105,820	217,773
Net profit	$945,767	$1,740,160

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TRADE BRIEFS

National Electric Products Corporation, Pittsburgh and New York, announces the opening of its own branch in San Francisco.

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T. R. Langen has been appointed northeastern district manager of the Westinghouse organization with headquarters in New York.

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Inland Steel Company of Chicago announces the addition of Inland steel sheet piling.

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Jones & Manter Corporation, Boston, has been appointed district sales representative in the New England territory, with the exception of western Connecticut, by the Despatch Oven Company.

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Euclid Crane & Hoist Company and the Armington Engineering Company, Euclid, Ohio, have approved a plan of merger whereby the manufacturing facilities and engineering experience of the two companies are combined in the Euclid Crane & Hoist Company, the name of which is now Euclid-Armington Corporation.

•

L. D. McFarland Company recently opened a sales office at 30 Church Street, New York, under Fred E. Wright.

National Safety Code Developed for Elevators

A NEW national safety code for elevators, dumbwaiters and escalators, developed under the technical direction of the American Society of Mechanical Engineers, the American Institute of Architects and the U. S. Bureau of Standards, has just been approved by the American Standards Association.

Approval of the revised code by the standards association followed nearly four years of research on elevator safety devices at the United States Bureau of Standards and extensive investigation by a technical committee composed of 38 representatives of architectural, engineering, governmental, and other organizations. Sullivan W. Jones, former state architect of New York and representative of the American Institute of Architects, is chairman of the committee, and John A. Dickinson research fellow of the Bureau of Standards, who conducted the research work at the bureau, is secretary.

The code insists upon fireproof elevator shaft inclosures and fireproof housing for the elevator machinery so that elevator evacuation of a fire-swept skyscraper will be possible in case of emergency.

Although the framers of the code found that present safety devices would permit safe elevator operation at any speed, it is believed that the limit of speed will not go much beyond 1,200 ft. per minute because of the discomfort to passengers resulting from rapid change in air pressures in ascent or descent.

Any speed above 700 ft. per minute requires automatic operation with automatic floor leveling devices because of the difficulty of stopping more rapidly moving cars at floor levels. It was also found that at speeds of over 800 ft. per minute an operator was unable to distinguish floor numbers more than 4 ft. high.

The code also includes provisions for the safe operation of freight and other types of elevators, the passenger-operated lifts, escalators and dumbwaiters.

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Russia Purchases More Equipment

EXPORTS OF ELECTRICAL EQUIPMENT from the United States during June of this year amounted to $3,034,044, which is a gain of $25,889 over the same month last year. This increase is accounted for by larger purchases made in this country by Russia, shipments destined for that country being valued at $1,076,790 for the month. The bulk of these shipments consisted of power switches and circuit breakers over 10 amp., accessories and parts for generators, portable electric tools, industrial electric furnaces and ovens and other heating devices, accessories and parts for motors, 1 to 200 hp. stationary motors and double-current and motor-generators, dynamotors, synchronous and other converters.

All other European countries registered small decreases in imports of electrical equipment from the United States.

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New York Metal Prices

	Aug. 12, 1931 Cents per Pound	Aug. 19, 1931 Cents per Pound
Copper, electrolytic	7⅛	7⅛
Lead, Am. S. & R. price	4.40	4.40
Antimony	6.60	6.55@6.60
Nickel, ingot	35	35
Zinc, spot	4.20	4.15
Tin, Straits	26	25.60
Aluminum, 99 per cent.	23.30	23.30

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DELINQUENT ELECTRICAL ACCOUNTS

(National Electrical Credit Association)

Number of Accounts Reported

Division	July 1930	July 1931	Per Cent Inc. or Dec.	Seven Months 1930	Seven Months 1931	Per Cent Inc. or Dec.
New York	250	221	—11.6	2,176	1,840	—15.4
Middle and Southern Atlantic	126	110	—12.7	1,190	876	—26.4
New England	89	101	—13.5	888	663	—25.3
Central	641	501	—21.8	5,372	4,166	—22.4
Total	1,106	933	—15.6	9,626	7,545	—21.6

Total Amounts Reported

Division	July 1930	July 1931	Per Cent Inc. or Dec.	Seven Months 1930	Seven Months 1931	Per Cent Inc. or Dec.
New York	$39,229	$32,776	—16.4	$375,595	$242,780	—35.4
Middle and Southern Atlantic	20,594	9,264	—55.2	185,868	111,684	—40.0
New England	11,723	8,749	—25.2	131,543	59,537	—54.7
Central	69,616	47,832	—31.3	734,136	393,430	—47.8
Total	$141,162	$98,621	—30.1	$1,427,142	$797,431	—44.1

Market Conditions

CONSTRUCTION is decidedly more active in the Eastern district and September is expected to bring an encouraging increase in volume of equipment orders. Government orders have supplemented private buying in a large way. Small appliance sales throughout New England show an encouraging increase, but central-station supplies are spotty.

——INCREASED BUILDING OPERATIONS ON THE PACIFIC COAST help to make up for lack of equipment buying in other directions. Substantial industrial buying is anticipated for September. Government orders have greatly exceeded power and light company buying.

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MIDDLE WEST

—VERY LITTLE, IF ANY, *change in general business conditions is observed this week in the Middle West section. Industrial activity remains fairly steady with production and employment figures showing little change.*

—MAJOR ACTIVITIES *are maintaining their positions, although not without difficulty. Discouraging reports and rumors of further wage reductions are contributing to an already uncertain feeling.*

Some encouragement is being derived from the resumption of automotive production in several plants and in the anticipation of increased production in the steel industry through the placing of large tonnages of steel, now in the offing. Although mail order sales in dollar value are off some 6 per cent from a corresponding period last year, tonnage sales are actually greater than last year.

Cooler weather has retarded the demand for summer merchandise and retail sales are somewhat spotty. While carloadings are generally lower, two carriers report an increase in the number of revenue cars handled for the first half of the month. Railroad equipment and maintenance purchasing is still unusually quiet. The various utility companies are keeping pace with general conditions, buying for immediate requirements. Construction schedules are being maintained, although the possibilities of increased activity are, at the present moment, remote.

CONSTRUCTION PROJECTS

Bond Falls Hydro-Electric Company, Green Bay, Wis., Harry A. Bond, president, recently organized, plans hydro-electric power plant on Ontonagon River, near Ontonagon, Mich., to cost over $300,000. Chevrolet Motor Company, Detroit, Mich., plans mechanical school for shop apprentices to cost close to $75,000. Ford Motor Company, Dearborn, Mich., has purchased property near Cleveland, Ohio, for assembling plant to cost over $5,000,000, project to include a power plant. Indiana State Highway Commission, Indianapolis, Ind., will receive bids until August 26 for sixteen to 30 air compressors. Cincinnati *Times-Star*, Cincinnati, Ohio, has plans for a newspaper printing and publishing plant to cost over $1,000,000. Pella, Iowa, will receive bids until September 2 for a 750-kw. steam turbo-generator, condenser and auxiliary equipment.

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NEW ENGLAND

—BUYING OF ELECTRICAL *supplies in this district during the past week was confined principally to small power apparatus and in some measure to supplies for interior lighting.*

—SMALL MOTOR SALES *were reported uneven, with one manufacturer recording little change in the demand and another reporting a slight pick up in orders during this month. Continued demand for special-purpose motors, particularly for marine service, is reported.*

Orders for control equipment reported by one company show a slight upward trend beginning about the first of August. Another manufacturer records an increase in buying of motor-generator sets and small converters, the latter for radio purposes. Central-station supplies are spotty. One manufacturer reported placement of orders amounting to about $4,000 for switch and control for a large project. Industrial electric lighting is receiving attention and a number of interesting factory and shop projects in this field are about to be closed. New construction wiring needs are in good volume and include special lighting units in schools and institutions which will cost over $500,000 for eastern Massachusetts. Encouraging and of marked interest is the merchandising growth recorded in Maine. One utility reports sales of appliances during the past week amounting to about 16 per cent over last year's.

CONSTRUCTION PROJECTS

Massachusetts National Guard Air Corps, Boston, Mass., will soon ask bids for a hangar and shops at Boston municipal airport to cost about $250,000. Salem *Evening News*, Salem, Mass., has filed plans for a printing and publishing plant to cost over $90,000. Berger Brothers Company, New Haven, Conn., will build multi-story addition to surgical apparatus plant to cost close to $100,000.

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PACIFIC COAST

—RETAIL TRADE VOLUME *is beginning to equal last year's figures when proper allowance is made for lower prices. Some big building jobs, such as the $8,000,000 Los Angeles federal building and the San Francisco War Memorial and Golden Gate Bridge, will help equalize conditions as compared with last year.*

—PUBLIC AND GOVERNMENT STRUCTURES *and small residences comprise the bulk of building, with a marked increase in $250,000 apartment house jobs, five of the latter class being reported in one week in the Bay area.*

Much industrial buying is predicted for September, but dealers and contractors in areas affected by fruit and canning operations report a disappointing season with overstock carryovers. The outstanding contract of the week covers a war memorial and opera house in San Francisco, totaling about $280,000, with auto-call system of $27,000 additional. Another recent interesting contract covered a $142,500 electrical award for the Bay bridge. Hospital work is prominent. Other government ordering covers federal buildings for Long Beach and Glendale averaging $550,000 each, a $200,000 barracks addition for Mare Island and a projected installation of lighting equipment, actuated by a 120-hp. Diesel engine and 90-kva. generator for lighting Carlsbad caverns in New Mexico. Several thousand dollars' worth of reflectors, floodlights and wiring supplies have been bought through San Francisco headquarters this year for various national parks as far east as the Rockies. Government work markedly predominates and power company buying is very light.

Industrial buying of motors and apparatus in Seattle and the Puget Sound district shows no improvement over the past few weeks, with every indication of continuance of this condition until well into the fall months. Lumber mill buying is negligible, although a slight

increase in production is noted and more optimism is being shown by larger operators. Sales reported last week included four motor-generator sets for elevator installations in an office building in Portland involving between $70,000 and $80,000 and 50 motors, ranging from 100 hp. down, the majority 25 hp. and under, to miscellaneous sources; lighting panels and switchboards for the Seattle federal building, also for the marine hospital, each installation costing between $7,000 and $8,000; approximately $3,000 worth of miscellaneous switchgear to central stations in Seattle, Tacoma and Portland; 25 distribution transformers from 15 kva. down to a Seattle central station; ten motors from 15 hp. down to irrigation districts in eastern Washington and 30 motors from 100 hp. down to miscellaneous sources.

CONSTRUCTION PROJECTS

Pacific Gas & Electric Company, San Francisco, Calif., has filed plans for a power substation to cost about $80,000. Overland Terminal Warehouse Company, Los Angeles, Calif., has plans for a terminal warehouse to cost $835,000. Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until September 23 for hangar at new airport at Sunnyvale, Calif., to cost close to $1,000,000. Santa Barbara State Teachers College, Santa Barbara, Calif., will take bids for a three-story science building to cost more than $200,000. Puget Sound Power & Light Company, Seattle, Wash., plans extensions in transmission and distributing lines at Index, Wash., and vicinity to cost close to $40,000.

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SOUTHEAST

—CENTRAL-STATION PURCHASES *continue on a hand-to-mouth basis in fair volume with industrial activities quiet, though inquiries seem to be looking up somewhat. Appliance sales are holding up well.*

The largest order reported last week was for street-lighting equipment approximating $20,000 to $25,000 for a Louisiana town. A power company on the west coast of Florida ordered $15,000 worth of voltage regulators and a Georgia company ordered 60,000 lb. of bare and weatherproof copper wire and $3,100 worth of galvanized conduit. A power company in Tennessee purchased power transformers amounting to $5,500, while a Georgia company ordered power and distribution transformers aggregating $4,700. Another central-station order was for $4,450 worth of time switches. The city of Jacksonville has asked bids on varnished-cambric and lead cable which will approximate $12,000.

CONSTRUCTION PROJECTS

Virginia-Carolina Chemical Company, Richmond, Va., has plans for a fertilizer plant at East St. Louis, Ill., to cost over $100,000. Portsmouth, Va., plans electrification of municipal pumping plant for water system to cost $50,000. Bowling Green Refining Company, Bowling Green, Ky., has approved plans for an oil refining plant to cost over $160,000. Rex Lumber Company, Graceville, Fla., contemplates improvements in planing mill and plant to cost about $100,000.

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EASTERN

—TAKING CONTRACT AWARDS *as a basis for activity in the electrical equipment market, the month of August is developing rather unexpected proportions in the Eastern district and the turn of September, just ahead, is being viewed with more optimism than evidenced for some time past. Government account is giving impetus to the situation with the expanding volume of construction throughout the country to move forward during the next few months.*

—WHILE BUYING IS STILL *limited among central stations and industrials, there is more inclination to place commitments than for several weeks past, probably inspired by the fact that present attractive levels for equipment should be taken advantage of. Floodlighting apparatus is moving under a better demand.*

Seven manufacturers entered bids for a turbo-generator unit for the Portsmouth, N. H., navy yard, a low figure of $22,810 being tendered by the Moore Steam Turbine Corporation; the prices ranged from that level to $32,400. A New York manufacturer has secured an order from a metropolitan power company for transformers and switchgear totaling $30,000. Allis-Chalmers Manufacturing Company has contracted with the New York Edison Company for equipment for a new power substation at Yonkers, N. Y., approximating $110,000; the station will be used in connection with power interchange agreement with the Niagara-Hudson Power Corporation, and New York Edison Company is now securing a right-of-way in Westchester County for a steel tower transmission line for connection with the Niagara system at a point south of Poughkeepsie. Blaw-Knox Company, Pittsburgh, Pa., has taken an order for a quantity of steel transmission towers for a power line from Peoria, Ill., to Chicago, two Western fabricators sharing in the total contract.

In connection with electrification work, Long Island Railroad Company has placed an order with Allis-Chalmers Manufacturing Company for equipment to an amount of $350,000. Westinghouse Electric & Manufacturing Company is the successful bidder for motors, controls and auxiliary equipment for two motor flat cars for the municipal subway system, New York, the units to be constructed by the Magor Car Company. Another industrial award is that of the Cerro de Pasco Copper Company, New York, to Westinghouse Electric & Manufacturing Company for complete electric hoisting equipment for 2,200-ft. vertical shaft at its copper properties in South America, with lifting speed of 1,800 ft. per minute, including 1,300-hp. motor, controls and accessories.

CONSTRUCTION PROJECTS

Signal Supply Officer, Signal Corps, Army Base, Brooklyn, N. Y., will receive bids until August 28 for quantity of wire, cable rings, etc. (Circular 9); also, until September 2 for 58,220 ft. telephone cable, quantity of other cable, 48 reels, etc. (Circular 10). Petroleum Chemical Corporation, New York, N. Y., contemplates plant to cost over $250,000. Board of Education, Newark, N. J., will receive bids until August 27 for generators, electric motors and other equipment. Pressed Steel Car Company, Pittsburgh, Pa., has approved plans for plant at Pittsburgh, Pa., to cost over $750,000. State Water Power and Resource Board, Harrisburg, Pa., will receive bids until September 1 for construction of dam at Pymatuning, near Jamestown, Pa., to cost over $1,000,000. General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until September 3 for insulated cable, cable terminals, conduit, etc. (Schedule 2678). Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until September 1 for two electric motors for Mare Island navy yard (Schedule 6325).

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SOUTHWEST

—THERE APPEARS TO HAVE *been no definite change in conditions, according to the reports of manufacturers. A lot of small orders and very few jobs of contract size are in sight. The reaction seems to show a little more optimism than at any time during the past month.*

Contracts closed in the past week include a switchboard for the Missouri University power house to cost $4,500; eleven motors, 40 hp. each, with control for large grain elevator, $8,500, and two engine-driven generators for a contractor's plant, $2,500.

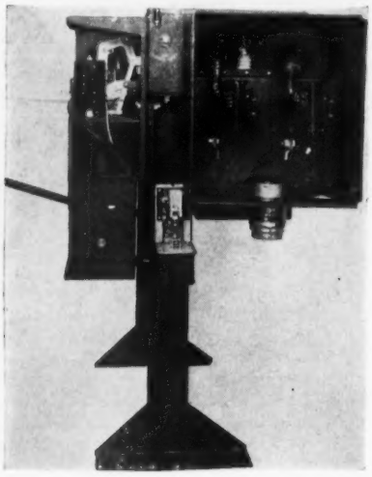
CONSTRUCTION PROJECTS

Loose-Wiles Biscuit Company, Kansas City, Mo., has purchased tract of land at Los Angeles, Calif., and will have plans drawn for branch plant to cost about $1,000,000. State Board of Affairs, Oklahoma City, Okla., plans industrial buildings at state institute at Taft, Okla., to cost $125,000. Texas Empire Pipe Line Company, Houston, Tex., plans five electric-operated pumping plants to cost over $400,000, in connection with pipe-line project.

New Equipment Available

Metal-Clad Switchgear for Station Auxiliaries

METAL-CLAD SWITCHING EQUIPMENT designed for controlling station auxiliaries, such as pumps, fans and other motor-driven equipment, has been announced by the Delta-Star Electric Company, Chicago. There are two solenoid-operated circuit breakers which are also provided with hand control. The cur-



rent transformers for use with instruments and relays are located in a compartment in turn provided with terminators for protection of the incoming and outgoing cables. The unit is complete with control relays for the closing coils, with auxiliary switches, indicating lamps, trip coils, circuits and electrical interlocks. Breakers can be also provided with complete electrical or mechanical interlocks as desired.

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Reduces Magnetic Effect on Watch Movements

WATCH MOVEMENTS of the railroad grade which are only slightly affected by magnetism, even if the steel parts of the watch have been permanently magnetized in a magnetic field of 3,600 lines per square inch, have been used recently by the Hamilton Watch Company and the Illinois Watch Company. The success of this development has been largely due to the use of an "Elinvar" hairspring in place of the carbon steel hairspring. "Elinvar" is a nickel alloy steel developed by Dr. C. E. Guillaume, Director of the International Bureau of Weights and Measurements. In this alloy elasticity is unaffected by changes in temperature; this allows watchmakers to discard the split-rim bimetallic balance wheel originally introduced 165 years ago to overcome the temperature errors of the steel hairspring and in its place to use a solid rim, non-magnetic balance wheel.

The damaging effects of magnetism on high-grade watches are well known to electrical engineers, hence the importance of this discovery and development.

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A NEW TYPE OF FLOODLIGHT designed for the illumination of aprons in front of hangars, approaches to buildings and the interiors and exteriors of hangars has been announced by the General Electric Company. A Fresnel lens and a 5-in. silvered-glass spherical mirror distribute the light smoothly and efficiently throughout approximately 180 deg. in the horizontal plane, with a vertical divergence of about 18 deg. The floodlight is equipped with an adjustable mogul screw-base lamp socket for centering the filament with respect to the focal point of the mirror and lens. The floodlight will accommodate either a 1,000-watt, 115-volt, T-20 airway beacon lamp with a light center length of 4¾ in., or a 500-watt, 115-volt, G-40 lamp with a light center of 4¼ in.

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Self-Contained, Accessible Automatic Oscillograph

A NEW TYPE OF OSCILLOGRAPH for recording automatically all fluctuations on power systems has been introduced by the Westinghouse Electric & Manufacturing Company. This type "PA" automatic power oscillograph is more accessible, more flexible and easier to adjust than the power Osiso and operates within ½ to 1 cycle of a 60-cycle wave after the appearance of a fault.

Although designed primarily for recording automatically all chance disturbances on power systems, the "PA" oscillograph is adapted as well to staged tests of all kinds. Any mechanical quantity translatable into an electrical one may be recorded. It is often used in testing laboratories to determine wave characteristics.

Some of the features are: Greater operating speed with the magnetic clutch and shutter, recording starts within 1/120 to 1/60 of a second, which is a new speed for this type of apparatus; gear drive from an integral motor, low cost, utility, simplicity and compact daylight loading film holder.

Low Melting Point Brazing Alloy

A NEW BRAZING ALLOY which is called "Sil-Fos," containing a small percentage of silver and described as flowing freely at 1,300 deg. F., is announced by Handy & Harman, 57 William Street, New York.

"Sil-Fos," it is claimed, promises to be worthy of consideration where higher melting point base metal brazing or welding alloys cannot be used without danger of weakening, distorting or destroying the parts adjacent to the joints when it is remembered that the commercial silver solders containing 50 per cent silver or less require 1,400 to 1,600 deg. F. to melt the base metal brazing alloys from 16 to 2,100 deg. F.

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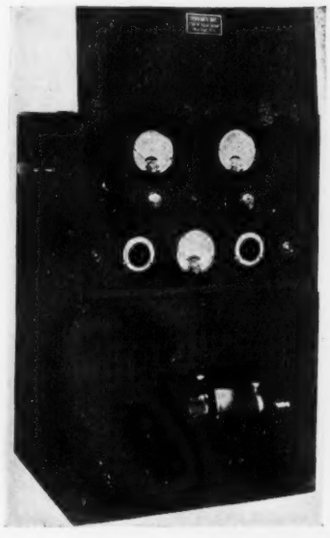
Radio Amplifier as Oil Tester

AN OIL-TESTING DEVICE in the form of a four-stage high gain radio amplifier, mounted in a portable steel cabinet and equipped with meters and standard oil test cup, has been announced by Ferranti, Inc. The oil to be tested is placed in the cup, which has a gap having disks 1 in. in diameter and set $\frac{1}{10}$ in. apart.

The chief advantages of this oil tester, it is claimed, lie in the fact that it may be easily carried about from place to place and that instead of using a dangerously high voltage for test purposes the ordinary 115-volt electric light supply is used. This eliminates a great deal of the danger attached to the everyday



procedure of oil testing. The complete equipment assembled has a total weight of 90 lb. complete with tubes and batteries. The dimensions are 13¾x12¼x20 in. and the cabinet is equipped with a padlock to lock the whole equipment.